National Institutes of Health (U.S.) Division of Research Services. Biomedical Engineering and Instrumentation Branch. Annual report.

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DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER
Z01 RS 10001-20 BEI

PERIOD COVERED
October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Pharmacokinetics

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

R.L. Dedrick	Chief,CHES	BEIB, DRS
Others:		
F.Farris	Southeastern Coll. of Pharm. Sci.	
F.King	North Carolina A&T Univ.	
R.J. Lutz	Chemical Engineer	BEIB, DRS
P.F. Morrison	Physical Scientist	BEIB, DRS

COOPERATING UNITS *(if any)*
CPB-NCI, DR-CC, NTP-NIEHS, SNB-NINCDS, NHLBI and NMOB-NCI

LAB/BRANCH
Biomedical Engineering and Instrumentation

SECTION
Chemical Engineering Section

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.7	0.7	

CHECK APPROPRIATE BOX(ES)
☒ (a) Human subjects ☒ (b) Human tissues ☐ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Pharmacokinetic models are developed for the distribution and disposition of drugs, environmental contaminants, and endogenous metabolites in animals and humans. They provide a plausible set of equations that can be used to extrapolate data from animals to humans and thereby improve chemotherapy and risk assessment. Consideration of regional drug delivery has continued with emphasis on intra-arterial and intracavitary administration. Drug streaming from arterial catheters appears to be a frequent problem leading to nonuniform distribution of drug in the infused tissue and compromising studies of toxicity and therapeutic effect. Work is in progress on the development of a physiological pharmacokinetic model for methyl mercury and inorganic mercury in the rat. Work is also in progress on the adaptation of a pharmacokinetic model for cis-diamminedichloroplatinum(II) to other platinum-containing complexes. Increased emphasis has been placed on the pharmacokinetics of macromolecules such as monoclonal antibodies and immunotoxins.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

ZO1 RS 10002-23 BEI

PERIOD COVERED

January 1, 1988 to May 31, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Implant Device Development

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

John W. Boretos	Physical Scientist	BEIB DRS
Angelo Russo, M.D.	Pathologist	NCI
F.T. Hambrecht, M.D.	Health Science Adm.	NINCDS
Richard Clark, M.D.	Heart Surgeon	NHLBI
Mark Bolander, M.D.	Orthopedic Surgeon	NIDR
Harvey Pass, M.D.	Cancer Surgeon	NCI

COOPERATING UNITS *(if any)*

CR, CC, NIH; NS, NINCDS, NIH, FNP, NINCDS, NIH; S, NHLBI, NIH

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Chemical Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD. 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
1.0	0.7	0.3

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

The purpose of this project is to study the interaction between biomaterials and the physiological environment and to determine the suitability of specially-prepared biomaterials for use in various contexts. Polymers, metals and ceramics are important for use in catheters, heart-assist pumps, electrode insulation and similar implant applications. Variations in these materials as well as physically induced stress and environmentally accelerated degradation can severely reduce their effectiveness for long-term use as surgical devices. Previous studies undertaken by this project have shown a relationship between the molecular chain structure and resistance to hydrolysis. Recent evidence suggests that physical forces such as stress induced during fabrication can promote a form of stress corrosion. *In vitro* test data and SEM photomicrographs of surgical explants of various polyurethane classes show that premature failure is often the result of a combination of forces acting on the polymer at stress risers. Polymer systems and composites capable of time dissolution offer significant advantages in the development of devices that allow natural tissues to take over as healing progresses. Tissue ingrowth into porous materials provides greater stability for specific implants. A strong correlation exists between these *in vitro* and *in vivo* observations over short and long term periods of study. A polymer system has been developed that can be used to produce vascular stenosis to varying degrees for the purpose of study, control and treatment of various physiological disease states. This system relies upon the controlled dissolution characteristics of biodegradable polymers and hydrogels.

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DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10034-11 BEI

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Three-Dimensional Histological Reconstruction

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

S.B. Leighton	Mechanical Engineer	BEIB, DRS
A.M. Kuzirian	Neuroanatomist	LB, NINCDS

COOPERATING UNITS *(if any)*

LB, NINCDS

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Mechanical Engineering Section

INSTITUTE AND LOCATION

National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS: 0.2	PROFESSIONAL: 0.2	OTHER: 0

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
- ☐ (a1) Minors
- ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

A semi-automatic system for acquiring three-dimensional structural information about histological material is being developed. The system should be faster and more reliable than techniques that use serial sections, although resolution may be limited. In brief, an embedded tissue block will be fixed relative to a scanning electron microscope imaging system, the surface of the block will be imaged and the image stored, and successive slices will be removed by a built-in microtome.Handling and registration of thin sections will thus be eliminated. Human and computer pattern recognition will transform the resulting set of images into a three-dimensional reconstruction. Oxygen plasma etching has been found to give sufficient topographic relief that the resolution of the images is now limited by the SEM and not by the preparation technique. The images of Hermissenda Crassicornis obtained by this technique correlate well with TEM images of the same tissue.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10039-11 BEI

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Biophysical Instrumentation and Methodology

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

Marc S. Lewis	Research Chemist	BEIB, DRS
Allen P. Minton	Research Chemist	LBP, NIDDK

COOPERATING UNITS *(if any)*

LBP/NIDDK

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Microanalysis

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.8	0.8	

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
- ☐ (a1) Minors
- ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

The project is designed to develop new instrumentation and methods and to improve existing instrumentation and techniques for the characterization of biological macromolecules and for study of their interactions. Analytical ultracentrifugation, the techniques ancillary to it, and methods of data analysis using mathematical modeling appropriate for these techniques are the major areas of interest.

Studies on the application of mathematical modeling to problems of ultracentrifugal analysis have been continued. The applications of these studies are described in the project report 10184-05. Major progress has been made in the development of data acquisition systems. A data acquisition system using the IBM XT computer has been completed and successfully tested and a similar, but more sophisticated and flexible system using the Macintosh II is nearing completion. New methods of performing experiments and analyzing data have been developed and work is continuing in this area. Feasibility studies toward the development of fluorescence scanning data acquisition systems of very high sensitivity have been continued.

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DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE **NOTICE OF INTRAMURAL RESEARCH PROJECT**	PROJECT NUMBER Z01 RS 10043-11 BEI

PERIOD COVERED
October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Fiber Optic Probes

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

John I. Peterson	Chemist	BEIB, DRS
Einar Stefansson	Asst. Prof.	Dept. Ophtha., Duke University Medical Center

COOPERATING UNITS *(if any)*
RVR and EICB

LAB/BRANCH
Biomedical Engineering and Instrumentation

SECTION
Chemical Engineering Section

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
.8	.8	

CHECK APPROPRIATE BOX(ES)
☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
☐ (a1) Minors
☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

A suitable device is needed for the direct measurement of oxygen partial pressure (pO_2) in blood and tissue for both clinical and research applications. Methods currently available for measuring pO_2 lack convenience, reliability, speed, and applicability to many situations of interest. Efforts to develop electrical sensors have not been successful. It is desirable to have a very small pO_2 sensor that can be inserted into a blood vessel or tissue with little disturbance, which will provide instantaneous pO_2 monitoring for either short or extended periods of time. A fiber-optic sensor is ideal for this application, with the advantage, for physiological use, of very small size and flexibility, safety, and low cost. A pO_2 sensor has been developed, based upon the principle of fluorescence quenching by oxygen. The feasibility of the sensor and its satisfactory performance have been demonstrated in *in vitro* and *in vivo* tests in preceding years. The development of the sensor as a needle probe has been accomplished. The current work has resulted in the final form of an instrument suitable for research applications.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10096-08 BEI

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Light Scattering Method for Evaluation of Platelets

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

R.F. Bonner	Physicist	BEIB, DRS
T.R. Clem	Elect. Engineer	BEIB, DRS
S.B. Leighton	Mech. Engineer	BEIB, DRS
J. Fratatoni	Section Chief	DBBP, CDB, FDA
B. Poindexter	Biologist	BBPB, DBBP, CDB, FDA
P. Mintz	Director	Blood Bank, U.Va.
G. Anderson	Researcher	Blood Bank, U.Va.

COOPERATING UNITS *(if any)*

Center for Drugs and Biologics, FDA and Blood Bank, U. Virginia

LAB/BRANCH

Biomedical Engineering and Instrumentation Branch

SECTION

Electrical and Electronic Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.2	0.2	

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☒ (b) Human tissues ☐ (c) Neither
- ☐ (a1) Minors
- ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

In the preceding years of this project we have developed a unique instrument to assess noninvasively the concentration and morphology of transfusion platelets via a rapid, clinically acceptable procedure. The basis of this measurement is low-angle multiple scattering of light and the changes in this signal associated with orientation of the subset of the platelet population that is discoid. The instrument, under microprocessor control, calculates the concentration and percentage of platelets that are discoid within a transfusion bag. This requires fewer than three minutes. These measurements are being used in a variety of research studies of the effects of various storage conditions (e.g., temperature transients, bag wall material, addition of pharmacological agents) on the condition of stored platelet concentrates. The instrument was originally designed to play a role in improving the quality of platelet transfusions, by routine and accurate noninvasive assessment of platelet quality (as represented by the degree of normal platelet morphology). To this purpose ongoing studies at the Univ. of VA Medical School Blood Bank and National Labs of the American Red Cross are directed at determining the degree of correlation between the noninvasive measurement and clinical efficacy of the platelet transfusion.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE **NOTICE OF INTRAMURAL RESEARCH PROJECT**	PROJECT NUMBER Z01 RS-10097-08 BEI

PERIOD COVERED
October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Studies in Cardiovascular Dynamics

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

R.S. Chadwick, Head	HeadTheor. Biomech.Group	BEIB, DRS
J. Ohayon	Visiting Fellow	BEIB, DRS
M. Lewkowicz	Guest Worker	BEIB, DRS
C. Oddou	Professor	U. of Paris
P. Brun	Senior Researcher	INSERM U. 138
B. Levy	Senior Researcher	INSERM U. 141
A. Al Droubi	Staff Fellow	BEIB, DRS
J. Tyberg	Professor	U. of Calgary

COOPERATING UNITS *(if any)*
INSERM U.138 U.141, University of Paris XII, Laboratory of Physical Mechanics, University of Calgary, Cardovascular Research Laboratory

LAB/BRANCH
Biomedical Engineering and Instrumentation

SECTION
Mechanical Engineering Section

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
2.7	2.7	

CHECK APPROPRIATE BOX(ES)
☒ (a) Human subjects ☐ (b) Human tissues ☐ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

We have refined our existing model for myocardial and ventricular mechanics to include the effects of collagen on the elasticity of the myocardium and filling of the left ventricle, wall thickness and curvature effects, pathological fiber organization, myocardial blood flow, myocardial oxygen demand, and effects of electrical activation patterns. The model was used in conjunction with ultrasonic kinematic data, gated radionuclide ventriculography, and left heart catheterization data to determine performance parameters. The physiological relationships between phasic coronary arterial, venous, and left ventricular pressure and blood flow, were determined during a long diastole and control conditions A mathematical and physical model of myocardial blood flow was developed incorporating vessel collapse at the University of Paris XII. Also RF absorbtion from the myocardium was investigated experimentally at the University of Paris XII and INSERM U. 138 to determine the effect of loading on the spectral absorbtion coeffiecient. A theoretical model was developed to describe contraction of arterioles, and will be used to study mechanisms of hypertension. A model investigating the intraction of the right and left ventricles is being developed.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10098-08 BEI

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Laser Instrumentation for Vitreous & Cardiovascular Microsurgery

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

R.F. Bonner	Physicist	BEIB, DRS
P.D. Smith	Physicist	BEIB, DRS
M. Leon	Sr. Investigator	CB, NHLBI
A. Bartorelli	Fellow	CB, NHLBI
Y. Almagor	Fellow	CB, NHLBI
L. Prevosti	Guest Fellow	CB, NHLBI
C. Kupfer	Director	NEI

COOPERATING UNITS *(if any)*

Clinical Branch, NEI; Optical Science Branch, Naval Research Lab; Cardiology Branch and Surgery Branch, NHLBI; Quantronix Corp.; Infrared Fiber Systems; MCM Labs; Site Microsurgical

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Electrical and Electronic Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
2.5	2.5	

CHECK APPROPRIATE BOX(ES)

☒ (a) Human subjects ☒ (b) Human tissues ☐ (c) Neither

☐ (a1) Minors

☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

This program covers the long-standing development of laser microsurgical techniques that initially centered on ophthalmological applications and systems of interest in that field (pulsed carbon dioxide lasers and pulsed ND:YAG slit lamp-based laser systems). Its primary focus for the last 3 years has been in cardiological application of lasers, in particular laser angioplasty. In order to develop new laser microsurgical techniques in this new field, it was necessary to analyze a variety of laser sources and their tissue effects and the feasibility of transmission through flexible fiber optics. New sources such as Erbium:YAG (YLF) lasers coupled to zirconium fluoride optical fibers and excimer lasers coupled to fused silica fibers were examined, as well as more conventional sources (pulsed carbon dioxide and Nd:YAG lasers and continuous-wave argon and dye lasers).

In collaboration with the Naval Research Lab, we have developed the new erbium laser microsurgery technology, beginning with feasibility studies and proceeding to development of a microsurgical prototype using zirconium fluoride fibers. Refinement of this system is primarily directed towards intravascular ablation (laser angioplasty), but includes applications to intraocular surgery (particularly to vitreal membranes, trabeculotomy, cataract surgery and corneal transplantation), destruction of renal stones, and endoscopic microsurgery. Collaboration with industry in this technology are an integral part of this program.

Parallel development of excimer microsurgery has provided a microsurgical system for *in vivo* studies.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10109-08 BEI

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Adjunctive Heat Treatment of Cancer

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

R.L. Levin	Biomedical Engineer	BEIB, DRS
J. Delannoy	Fogarty Fellow	ROB, NCI
C. Charny	Biomedical Engineer	BEIB, DRS
D. LeBihan	Fogarty Scientist	DR, CC
E.J. Glatstein	Chief	ROB, NCI

COOPERATING UNITS *(if any)*

Radiation Oncology Branch, NCI and Diagnostic Radiology, CC

LAB/BRANCH

Biomedical Engineering and Instrumentation Branch

SECTION

Mechanical Engineering Section

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
4.0	3.5	.5

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☒ (b) Human tissues ☐ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

The purpose of this project is to develop adjunctive hyperthermia modalities for cancer treatment through theoretical and experimental studies of the spatial and temporal variation in the temperature field of tissues subjected to microwave and radiofrequency electromagnetic radiation. Currently, we are (1) measuring the patterns of energy deposition produced by a mini-annular phased array (MAPA) applicator within various types of extremity phantoms; (2) describing the electromagnetic fields of a MAPA in terms of its design parameters; (3) describing the transient thermal profiles within limbs produced by a MAPA; (4) measuring the effective thermal conductivity of perfused human tissues and (5) describing the systemic temperature and cardiac changes associated with heating various regions of the body. We are also developing a non-invasive method for measuring temperature using magnetic resonance imaging. These studies are forming the basis for the clinical system currently being tested.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE **NOTICE OF INTRAMURAL RESEARCH PROJECT**	PROJECT NUMBER Z01 RS 10112-08 BEI

PERIOD COVERED
October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Analysis of Microcirculatory Blood Flow by Laser Doppler Scattering

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

R.F. Bonner	Physicist	BEIB, DRS
T.R. Clem	Electrical Engineer	BEIB, DRS
H. Wagner	Section Chief	LNNS, NINCDS
T. Delaney	Sr. Investigator	ROB, NCI

COOPERATING UNITS *(if any)*
HB, NHLBI; CB NEI; LCI, NIAID; ROB, NCI; SN, NINCDS; LAP, DCRT; MedPacific,Inc, Seattle,WA; TSI, Inc, St. Paul,MI; Neurology and Gastroenterology Depts., USUHS, Bethesda, MD; Dept. Medicine, Med. Coll. S. Carolina, Charleston, SC.

LAB/BRANCH
Biomedical Engineering and Instrumentation

SECTION
Electrical and Electronic Engineering

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.4	0.4	

CHECK APPROPRIATE BOX(ES)
☒ (a) Human subjects ☐ (b) Human tissues ☐ (c) Neither
  ☒ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

This project has developed a clinically-useful method (laser Doppler instrument and its theory of operation) for clinical measurements of microcirculatory blood flow, number density of flowing red blood cells (RBCs), and mean RBC velocity. Assistance has been given to the commercialization of this methodology and its application to clinical research in many laboratories worldwide. Our clinical studies have been directed toward examining normal and abnormal microvascular dynamics through noninvasive clinical studies of skin and nasal mucosa, and in intra-operative clinical studies of muscle and CNS. Collaboration with USUHS is directed toward developing endoscopic application of this technology. Considerable theoretical work has been directed toward an adequate construct with which to interpret the physical measurements and refining the accuracy of the microcirculatory measurements. We have discovered abnormal microcirculatory patterns and responses in the skin of patients with sickle cell disease, hypertension, certain cardiac circulatory syndromes, diabetes, and skin cancer. The microcirculatory effects of therapy are monitored with this technique, affording a better understanding of the microcirculatory component of these diseases.

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DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10122-07 BEI

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Microcomputer Applications for the NIH Bio-Technology Unit (Pilot Plant)

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

T.R. Clem, Sr.	Electronics Engineer, EEES	BEIB, DRS
Other Investigators:		
Y. Shiloach	Chief, Bio-Technology Unit	LCDB, NIDDK
A. LeRoy	Chemical Engineer	BEIB, DRS

COOPERATING UNITS *(if any)*

LCDB - NIDDK

LAB/BRANCH

Biomedical Engineering and Instrumentation Branch

SECTION

Electrical and Electronic Engineering Section

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
1.0	0.75	0.25

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

The NIH Bio-Technology Unit (Pilot Plant) has various instrumentation needs that have not been previously addressed and is using some cumbersome techniques and/or outdated equipment. This project has been concerned with satisfying these instrumentation needs using modern equipment and low-cost desktop size personal computers (PCs). Several PCs have been acquired and are being installed to supply a variety of services, including process control, data acquisition, data analysis, and administrative functions. The instrumentation and process control functions use commercial equipment, as much as possible, and are interfaced using standard I/O connections, such as the IEEE-488 GPIB and the RS-232 Serial I/O ports.

Using these techniques allows changes in the parameters measured or controlled to be accomplished relatively quickly and easily. Utilizing the computational capabilities of the computer/controller allows initial selection of the operating parameters and dynamic alteration of these parameters as the process continues, thus allowing optimization of yields or detailed study of the process parameters.

NIH LIBRARY

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE **NOTICE OF INTRAMURAL RESEARCH PROJECT**	PROJECT NUMBER Z01 RS 10146-06 BEI

PERIOD COVERED
October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Prosthetic Urethral Sphincter

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

S. B. Leighton	Mechanical Engineer	BEIB, DRS
Steven Scoog, M.D		WRAMC
T. Radebaugh		BRCM, NIA

COOPERATING UNITS *(if any)*
BRCM, NIA and DCT, NCI

LAB/BRANCH
Biomedical Engineering and Instrumentation Branch

SECTION
Mechanical Engineering Section

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
.05	.05	0

CHECK APPROPRIATE BOX(ES)
☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

A number of techniques are used for treating urinary incontinence, including prosthetic sphincters. The present work concerns an entirely intraurethral artificial sphincter that can be implanted without surgery. Concepts are being explored that would allow the device to be used in situations in which surgery is contraindicated, and would presumably lower the cost. The valve would be appropriately matched to urethral dimensions, pressures, and flow rates. The valve would be potentially useful in cases of non-opening, normal valves as well as in cases of non-closing valves.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10151-06 BEI

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Nuclear Magnetic Resonance Imaging

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

Dr. David I. Hoult	Physical Scientist	BEIB, DRS
Other Personnel:		
Dr. Ching-nien Chen	Physical Scientist	
Dr. L. Kyle Hedges	Staff Fellow	
Dr. Robert Turner	Visiting Scientist	

COOPERATING UNITS *(if any)*

Department of Radiology, Clinical Center

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

NMR Imaging Laboratory

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
3.5	3.5	0.0

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

The VAX computing facility of the *in vivo* NMR Center is fully operational, and numerous magnetic resonance programs have been installed. In particular, a full simulation program for the solution of the Bloch equations has been completed. It allows solution for an arbitrary driving function, and also enables the construction of that function. Results can be displayed graphically, by hard copy, or by plotting. A three-dimensional reconstruction package has been produced, to be used with data obtained from the instruments in the Center. To this end, routines to read magnetic tapes from the Signa and CSI instruments have been successfully constructed.

A method for visualizing the electric field of an NMR probe has been developed using a liquid crystal display, and the variation of surface coil signal-to-noise ratio with coil position and dimension is being investigated.

A program to develop shielded gradient coils and a high-field, compact shielded solenoid for the CSI instruments has begun.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10162-06 BEI

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Wound Healing: Biology and Rheology

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

T. L. Talbot, MS	ACES	BEIB, DRS
D. Cromack, M.D.	Surgery	NCI
J. A. Norton, M.D.	Surgery	NCI
L. E. Thibault, Sc.D.	Bioengineering Dept,	Univ.of Pa

COOPERATING UNITS *(if any)*

NCI, University of PA, Philadelphia, PA

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Applied Clinical Engineering Section

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
2.0	1.5	0.5

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
- ☐ (a1) Minors
- ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Preliminary studies have been completed with swine models. These studies involved stamping an indelible grid (10 cm x 10 cm) on the skin of an anesthetized swine, excision of a 1 cm x 10 cm strip of the skin out of the grid area, and approximating the incision edges with silk sutures. Photographs of the grid were taken before excision, after excision, and after suturing. These photographs are being analyzed to determine the impressed strain on the wound closure and eventually relate this information to wound breaking strength (WBS).

Studies based on a rat model that relates biologic and pharmacologic interventions to WBS have been completed. Certain groups were treated pharmacologically during the wound healing process. Significant decrease in WBS was observed in these groups, compared to control groups. Further studies will include the comparison of a tumor-bearing group to control groups.

Rats treated with 8 mg/kg Adriamycin prior to or on the day of wounding demonstrated decreased wound breaking strength in incisional wounds at all intervals after wounding.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE **NOTICE OF INTRAMURAL RESEARCH PROJECT**	PROJECT NUMBER Z01 RS 10163-06 BEI

PERIOD COVERED
October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Magnetoencephalographic Localization of Foci of Neurologic Activity

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

P.D. Smith	Physicist	BEIB, DRS
W.S. Friauf	Section Chief	BEIB, DRS
S. Sato	Neurologist	OCD, NINCDS
D. Rose	Clinical Assoc.	MNB, NINCDS
R. Porter	Deputy Director	NINCDS
E. Ducla-Soares	Visiting Scientist	MNB, NINCDS
R. Martino	Electrical Engineer	CSL, DCRT

COOPERATING UNITS *(if any)*

Medical Neurology Branch, NINCDS; CSL, DCRT

LAB/BRANCH
Biomedical Engineering and Instrumentation Branch

SECTION
Electrical and Electronic Engineering Section

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
1.5	1.5	

CHECK APPROPRIATE BOX(ES)
☒ (a) Human subjects ☐ (b) Human tissues ☐ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

SQUID (superconducting quantum interference device) magnetometers have been used to study the magnetic activity associated with spike discharges occurring in interictal periods in patients with temporal lobe epilepsy. Magnetic field maps associated with specific spike discharges were obtained from measurements made with the SQUID at various locations on the skull. Improved mathematical models, which accounted for the head shape of the patient, the orientation of the SQUID, and volume current contributions, were developed to calculate the predicted magnetic field maps.

Good agreement was obtained between the experimental clinical maps and those predicted by the model. The model also provided close agreement with the EEG profiles to permit comparison of the localizing accuracy of both the EEG and MEG techniques. A small implantable current dipole source flap was constructed, evaluated, and preliminary clinical data collected. This permits a source to be placed at a known location for evaluation purposes. SQUID instrumentation has been improved with the addition of a shielded room, a gantry support system, and a space digitizer.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10170-06 BEI

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Biological Applications of a Computer-Controlled Analytical Electron Microscope

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

R.D. Leapman	Physical Scientist	BEIB, DRS
C.E. Fiori	Physical Scientist	BEIB, DRS
C.R. Swyt	Physiacl Scientist	BEIB, DRS

COOPERATING UNITS *(if any)*

None

LAB/BRANCH

Biomedical Engineering and Instrumentation Branch

SECTION

Electron Beam Imaging and Microspectroscopy Group

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.4	0.4	

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
- ☐ (a1) Minors
- ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Tests have been performed to determine limits of elemental detectability for the Gatan parallel-detection electron energy loss spectrometer (EELS) fitted on the BEIB Hitachi 200-keV analytical electron microscope. Data were recorded from a series of standard samples and also from freeze-dried cryosections obtained with a Reichert F4C cryoultramicrotome. Spectra were obtained using a "second difference" method that eliminates channel-to-channel gain fluctuations in the 1024-channel photodiode array. It was thus possible to detect characteristic core-edges with extremely small peak/background (e.g. 0.001). Comparisons were made with energy-dispersive x-ray spectra recorded concurrently. It was shown that both calcium and iron could be detected with comparable sensitivity using the two techniques. We therefore expect EELS to have superior sensitivity for these elements in high resolution applications with the Vacuum Generators Field emission STEM. Further studies have been made on radiation induced mass loss of fluorine in labelled neurotransmitters and neurohormones with the eventual aim of localizing these compounds in cells. Parallel-recorded EELS provides a great improvement in sensitivity over conventional serial-recorded EELS and may make such experiments feasible.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE **NOTICE OF INTRAMURAL RESEARCH PROJECT**	PROJECT NUMBER Z01 RS 10184-05 BEI

PERIOD COVERED
October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Physical Chemistry of Biological Macromolecules

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

Marc S. Lewis	Research Chemist	BEIB, DRS
Soo Il Chung	Research Chemist	LOBP, NIDR
Claude B. Klee	Section Chief	LMB, NCI
Samuel W. Luborsky	Research Chemist	LMB, NCI
Kenneth Yamada	Section Chief	LMB, NCI

COOPERATING UNITS *(if any)*
LOBP/NIDR and LMB/NCI

LAB/BRANCH
Biomedical Engineering and Instrumentation

SECTION
Microanalysis

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.2	0.2	

CHECK APPROPRIATE BOX(ES)
☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
☐ (a1) Minors
☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

The purpose of this project is to study the physical properties of a wide variety of biological macromolecules with the goal of correlating these properties to the structure and function of the macromolecules. The emphasis is on the thermodynamics of the interactions of these macromolecules and on their molecular size and shape. Analytical ultracentrifugation and mathematical modeling are the principal research techniques used.

Studies on the association of fibrinogen with other proteins involved in blood clotting and fibrinolysis have been continued. Studies in progress in this area deal with the association of fibrinogen with plasma and platelet Factor XIII and with the association of plasminogen with the D and E fragments of fibrinogen.

Studies on synapsin have been directed toward determining the nature of the reactions involved in the self-association of this protein.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE **NOTICE OF INTRAMURAL RESEARCH PROJECT**	PROJECT NUMBER ZO1 RS 10201-04 BEI

PERIOD COVERED
October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Automated Cell-Colony Scanner System

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

Seth Goldstein	Chief, MES	BEIB, DRS
Michael Brownstein	Chief	LCB, NIMH
Zhou Guan Xiong	Visiting Associate	BEIB, DRS

COOPERATING UNITS *(if any)*

Laboratory of Cell Biology, NIMH

LAB/BRANCH
Biomedical Engineering and Instrumentation

SECTION
Mechanical Engineering Section

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
.8	.8	

CHECK APPROPRIATE BOX(ES)
☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
☐ (a1) Minors
☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

A system has been developed to identify, for subsequent cloning, a minute fraction of cells in tissue culture possessing specific antibody, or other, fluorescent tags. Major emphasis was on making the system simple, inexpensive and readily available to investigators. A variety of concepts and techniques were identified and evaluated, and the most promising has been developed into a computer-controlled instrument for laser scanning of tissue culture dishes. Final evaluation, using a variety of cell cultures, is being performed.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE **NOTICE OF INTRAMURAL RESEARCH PROJECT**	PROJECT NUMBER ZO1 RS 10204-04 BEI

PERIOD COVERED
October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Cell Handling Studies

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

S.B. Leighton	Mechanical Engineer	BEIB, DRS
J.A. Berzofsky, M.D.		DCBD, NCI

COOPERATING UNITS *(if any)*
DCBD, NCI

LAB/BRANCH
Biomedical Engineering and Instrumentation

SECTION
Mechanical Engineering Section

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS: .5	PROFESSIONAL: .5	OTHER:

CHECK APPROPRIATE BOX(ES)
☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

In work on monoclonal antibodies, as well as in other endeavors, it is desirable to be able to isolate individual cells. We are developing an inexpensive device for placing one, and only one cell in each well of a microtitre tray, in culture medium. Thus, the progeny in each well will all be descendents of that single cell, or monoclonal. Our device is an improvement over the existing technique of limiting serial dilution, because each well contains a single cell, while a tray filled by the limiting serial dilution technique will contain many empty wells, and may also contain a few wells that contain two or three cells. The device will be fully automated, requiring minimal operator intervention.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10207-04 BEI

PERIOD COVERED

October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Clinical Engineering Program for the Clinical Center

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

R. Corsey	Electronic Engineer	BEIB, DRS
L. Becich	Executive Officer	OD, CC
C. Strong	Environmental Safety Officer	OD, CC
L. Eldridge	Associate Hospital Administrator	OD, CC

COOPERATING UNITS *(if any)*

Division of Engineering Services, Clinical Care Instrumentation Section, BEIB, DRS

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Applied Clinical Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
2.0	2.0	0.0

CHECK APPROPRIATE BOX(ES)

☒ (a) Human subjects ☐ (b) Human tissues ☐ (c) Neither
- ☐ (a1) Minors
- ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

A clinical engineering program has been provided for the Clinical Center. This program establishes standards and procedures for the hospital such as: (1) fire prevention; (2) calibration of medical equipment; (3) electrical safety; (4) incident (mishap) investigation; and (5) test and evaluation.

Another focus of the program is to participate actively in the formulation of national standards such as the National Electric Code, the Manual for the Safe Use of Electricity in Hospitals, the standards of the Joint Commission on the Accreditation of Health Care Organizations and the standards of the Association for the Advancement of Medical Instrumentation. A recent initiative is a joint undertaking with the Clinical Care Instrumentation Section, BEIB, of a medical equipment management program.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE **NOTICE OF INTRAMURAL RESEARCH PROJECT**	PROJECT NUMBER Z01 RS 10210-04 BEI

PERIOD COVERED
June 11, 1987 to July 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Electronic Patient Monitoring System

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

H.E. Cascio	Electronic Engineer	BEIB, DRS
Others:		
G. Hemphill	Engineering Technician	BEIB, DRS
K. Musallam	Head Nurse	NURS, CC
D. Cirelli	Administrative Officer	OD, CC

COOPERATING UNITS *(if any)*

CCOD

LAB/BRANCH
Biomedical Engineering and Instrumentation

SECTION
Electrical and Electronic Engineering Section

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.35	0.15	0.2

CHECK APPROPRIATE BOX(ES)
☒ (a) Human subjects ☐ (b) Human tissues ☐ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

An electronic patient monitoring system that alerts the nursing staff when a patient (or patients) is leaving the nursing unit is a welcome aid in the care of Alzheimer's Disease patients and other patients with dementia. The system design is based on a wrist watch size radio transmitter to be worn by the patient. A detector unit, placed at the two exit doors, senses the presence of any patient wearing a transmitter watch. With the detection of a patient's transmitter, a microprocessor based controller locks the exiting door, activates an alarm, and displays the patient's name and location on a computer monitor screen. The personal computer records the time and date for each patient's attempt to leave. This data is then used for statistical analysis. A maximum of eight patients can be monitored at two exit doors.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE **NOTICE OF INTRAMURAL RESEARCH PROJECT**	PROJECT NUMBER Z01 RS 10211-04 BEI

PERIOD COVERED
October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
IEEE-488 GPIB Personal Computer Instrumentation

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

T.R. Clem, Sr.	Electronic Engineer, EEES	BEIB, DRS

COOPERATING UNITS *(if any)*

None

LAB/BRANCH
Biomedical Engineering and Instrumentation Branch

SECTION
Electrical and Electronic Engineering Section

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.25	0.2	0.05

CHECK APPROPRIATE BOX(ES)
☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

The increased availability and reduced cost of the small personal computer have created increased interest in automating data acquisition and process or experiment control in areas where such things were not feasible before because of cost or complexity. With these changes also came a significant increase in the use of the IEEE-488 GPIB by instrument makers. By combining the two, sophisticated instrumentation and data acquisition systems can be assembled quickly and inexpensively. The BEIB is continuing to develop the expertise to provide guidance and assistance where this approach provides the optimal solution. This capability is further assisted by the BEIB Scientific Equipment Rental Program (SERP) specifying the IEEE-488 interface on new equipment acquisitions whenever possible. The increase at the NIH in the numbers and use of the IBM PC has made this capability of great value to the NIH Intramural Research program.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10212-04 BEI

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Fluoroimmunoassay Apparatus

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

W.S. Friauf	Chief, EEES	BEIB, DRS
R.L. Berger	Physicist	LTD, NHLBI
G. Hemphill	Electronic Tech.	BEIB, DRS

COOPERATING UNITS *(if any)*

CDC, Atlanta

LAB/BRANCH

Biomedical Engineering and Instrumentation Branch

SECTION

Electrical and Electronic Engineering Section

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.2	0.1	0.1

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

New rare earth chelate fluorescent probes with decay time constants much longer than the background decay time-constant of typical organic materials offer the potential of a great improvement in sensitivity of time-resolved fluorimetry. However, if they are to rival radioimmunoassay methods the sensitivity requirement becomes so great that overload recovery of the fluorescence detector is a major problem. Extensive past work on this problem is largely inapplicable to the very low speed and level requirements of this situation. Consequently initial effort is being applied to determining the optimum fluorescence detection device and ancillary signal overload limiting circuitry. Problems related to the fluorescent probe at extremely low sample concentrations will be studied in collaboration with CDC, which is interested in this approach as another tool for AIDS research. Finally an evaluation of the details of excitation, optical filtering, and digital signal processing will be worked out and optimized.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10213-04 BEI

PERIOD COVERED
October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Vitreous Fluorophotometry Analysis

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

P.M. Bungay	Chemical Engineer	BEIB, DRS
R.F. Bonner	Biophysicist	BEIB, DRS
M.S. Roy	Ophthalmologist	CB, NEI
M.J. Podgor	Statistician	BE, NEI

COOPERATING UNITS *(if any)*

Clinical Branch, NEI; Off. of Biometry & Epidemiology, NEI

LAB/BRANCH
Biomedical Engineering and Instrumentation Branch

SECTION
Chemical Engineering Section

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
1.0	1.0	

CHECK APPROPRIATE BOX(ES)
☒ (a) Human subjects ☐ (b) Human tissues ☐ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Vitreous fluorophotometry (VFP) is a clinical procedure for measuring the spatial distribution of fluorescence along the optical axis in a human subject's vitreous following administration of a fluorescent dye. In this project the clinical instrument is a Fluorotron Master manufactured by Coherent, Palo Alto, CA, and the dye is fluorescein sodium given by intravenous injection. The purpose of the project is to improve the protocols for conducting the measurements, processing the output from the instrument, and analyzing the results from the population of normal subjects and patients.

One disease for which VFP may be useful is diabetes and the associated pathology, diabetic retinopathy. Additional goals for this project are to evaluate VFP for use in 1) screening for early detection, and 2) monitoring for treatment efficacy in diabetes and other pathological conditions.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10214-04 BEI

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Photoradiation Therapy

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

P.D. Smith	Physicist	BEIB, DRS
R.F. Bonner	Biophysicist	BEIB, DRS
A. Russo	Section Chief	ROB, NCI
M. Manyak	Staff Fellow	ROB, NCI
T. Delaney	Clin. Assoc.	ROB, NCI
H. Pass	Surgeon	SURG, NCI
D. Matthews	Veterinarian	VRB, DRS
S. Evans	Clin. Assoc.	SURG, NCI
R. Perry	Clin. Assoc.	SURG, NCI

COOPERATING UNITS *(if any)*

ROB, NCI; SURG, NCI

LAB/BRANCH

Biomedical Engineering and Instrumentation Branch

SECTION

Electrical and Electronic Engineering Section

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
2.5	2.5	

CHECK APPROPRIATE BOX(ES)

☒ (a) Human subjects ☐ (b) Human tissues ☐ (c) Neither

☐ (a1) Minors

☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Photodynamic therapy (PDT), which is the interaction of light with hematoporphyrin derivative (HDP, Photofrin II), is in clinical use in several areas of application. Currently, PDT is being used clinically for a variety of skin lesions and for bronchial obstructions and is being investigated in the following: cancer of the prostate (beagles); carcinoma in situ of the bladder and urinary tract (foxhounds); and pulmonary metastatic disease (nude mice). Specially designed fiber optic probes and and introducers were manufactured for all cases, and calibrated in terms of irradiance delivered to the tissue. Photosensitized skin is a side effect of PDT, and the possibility of using agents to protect against this photosensitivity was addressed. In particular, hydrochlorothorazide appears to have a pronounced effect on reducing skin photosensitivity in nude mice models. Dosimetry for PDT is complex due to the variable irradiation levels within the tissue, sequestering of HDP, and tissue oxygenation. To address the first of these points and to permit light distribution within tissue to be formulated, light emanating from tissue was measured as a function of radial distance from the point of injection of the light into the tissue.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10218-04 BEI

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Analytical Electron Microscopy of Adrenal Chromaffin Cells

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

R.D. Leapman	Physical Scientist	BEIB, DRS
M. Foster	Physicist	BEIB, DRS
R.L. Ornberg	Biophysicist	LCBG, NIDDK
G. Kuijpers	Visiting Fellow	LCBG, NIDDK
H. Pollard	Chief	LCBG, NIDDK

COOPERATING UNITS *(if any)*

LCBG, NIDDK

LAB/BRANCH

Biomedical Engineering and Instrumentation Branch

SECTION

Electron Beam Imaging and Microspectroscopy Group

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.6	0.6	

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither

☐ (a1) Minors

☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Elemental concentrations in different compartments of rapidly frozen chromaffin cells have been measured with the aim of elucidating ionic changes that occur during secretion. Some cells were prepared under resting conditions as controls while other cells were stimulated with nicotine or potassium. In addition, intragranular pH was increased by treatment with NH_4Cl to inhibit secretion. Cells were rapidly frozen against a liquid helium cooled copper block and ultrathin frozen cryosections were prepared. Sections were freeze-dried in an analytical electron microscope and energy-dispersive x-ray spectra were obtained from granules, nuclei, cytoplasm and mitochondria. Concentrations of Na, Mg, P, S, Cl, K and Ca were obtained using ML spectral fitting.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10225-04 BEI

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Processing of High Resolution Electron Micrographs

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

Michael Unser	Visiting Fellow	BEIB, DRS
Benes Trus	Research Chemist	CSL, DCRT
Alasdair C. Steven	Visiting Scientist	LPB, NIADDK

COOPERATING UNITS *(if any)*

CSL, DCRT and LPB, NIADDK

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Office of the Chief

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
1.0	1.0	0.0

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

High resolution micrographs are often of poor quality, due to a variety of distortions and, especially, a very low signal-to-noise ratio. For micrographs of quasi-periodic arrays or sets of images of ostensibly identical free-standing particles, visual quality can be improved significantly by using correlation-averaging techniques.

We have improved algorithms that we had previously developed for the translational and rotational alignment of different views of ostensibly identical specimens and for the compensation of spatial deformations in quasi-periodic crystalline structures.

We have developed a technique for the quantitative assessment of spatial resolution that is equally applicable to periodic and non-periodic structures. This approach is based on the estimation of a spectral signal-to-noise ratio.

These methods have been applied successfully to structure determination and quantitative assessment of T7 Virus. They are being used for the analysis of micrographs of skeletal muscle filaments in states of relaxation and rigor.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE **NOTICE OF INTRAMURAL RESEARCH PROJECT**	PROJECT NUMBER Z01 RS 10232-03 BEI

PERIOD COVERED
October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Hardware Expansion for Flow Cytometer

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

C.C. Gibson,	Electronics Engineer	EEES, BEIB, DRS
J.A. Dvorak	Researcher	LPD, NIAID

COOPERATING UNITS *(if any)*
LPD, NIAID and EUII, BEIB, DRS

LAB/BRANCH
Biomedical Engineering and Instrumentation Branch

SECTION
Electrical and Electronics Engineering

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.3	0.2	0.1

CHECK APPROPRIATE BOX(ES)
☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
☐ (a1) Minors
☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Due to high maintenance costs a complete redesign of the flow cytometer's electronics is underway. The interface circuitry is being simplified. The PDP-11/34 is replaced by an Intel 386 computer running at 20 MHz. The software is rewritten to implement all previous functionality, plus new features.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10233-03 BEI

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Computer System for Analysis of Monkey Vocalizations

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

C.C. Gibson	Electronics Engineer	EEES, BEIB, DRS
Dr. D. Symmes		LCE, NICHD

COOPERATING UNITS *(if any)*

LCE, NICHHD and EUII, BEIB, DRS

LAB/BRANCH

Biomedical Engineering and Instrumentation Branch

SECTION

Electrical and Electronic Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.4	0.3	0.1

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither

- ☐ (a1) Minors
- ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

A computer system has been assembled to analyze monkey vocalizations and display the results in the traditional waterfall display. format. The computer is a DEC PDP-11/23 with a Sky array processor and a fast A/D front end. The complete system is almost an order of magnitude faster than any other commercial or non-commercial unit in use at this time. A direct memory interface is being built to capture data from a Kay Elemetrics model 7800.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10234-03 BEI

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Computer-Aided Tracking of Myosin-Coated Beads on Actin Filaments

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

C.C. Gibson	Electronics Engineer	EEES, BEIB, DRS
D.Sellers		LMC, IR, NHLBI

COOPERATING UNITS *(if any)*

LMC, IR, NHLBI and EUII, BEIB, DRS

LAB/BRANCH

Biomedical Engineering and Instrumentation Branch

SECTION

Electrical and Electronics Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.2	0.1	

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
- ☐ (a1) Minors
- ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

A manual system using a TV camera, VCR, and an IBM PC/XT clone has been put together to track particles moving in a microscope field. All programming is done in the computer language "C".

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10236-03 BEI

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Instrumentation for Various Electron Microscopes

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

C.C. Gibson	Electronics Engineer	EEES, BEIB, DRS
C.E. Fiori	Physicist	OC, BEIB, DRS

COOPERATING UNITS *(if any)*

EU II, BEIB, DRS and CSL, DCRT

LAB/BRANCH

Biomedical Engineering and Instrumentation Branch

SECTION

Electrical and Electronic Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.3	0.2	0.1

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

An IBM PC/AT Clone with a 10 MHz clock and 70 Mbyte hard disk unit has been purchased along with a number of add-in cards and an expansion unit. Work is almost completed on connecting the computer to the parallel detection unit on the Hitachi 700 scanning transmission electron microscope (STEM). This will permit data acquisition for electron energy loss spectroscopy (EELS) to occur an order of magnitude faster. The next phase is to connect the computer to BEIB's Cameca microprobe to automate data collection.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE **NOTICE OF INTRAMURAL RESEARCH PROJECT**	PROJECT NUMBER Z01 RS 10238-03 BEI

PERIOD COVERED
October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Automation of BEIB Information Processing Functions

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

J.R. Ellis	Expert, OC	BEIB,DRS
C. Martin	Management Analyst	MAO, DRS
C.C. Gibson	Electronics Engineer	EEE
R.L. Levin	Biomedical Engineer, MES	BEIB, DRS
M.E. Gavin	Management Assistant	OACSES, BEIB, DRS

COOPERATING UNITS *(if any)*
DRS, MAO and DCRT, CSL

LAB/BRANCH
Biomedical Engineering and Instrumentation Branch

SECTION
Office of the Chief

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS: 2.0	PROFESSIONAL: 1.5	OTHER: 0.5

CHECK APPROPRIATE BOX(ES)
☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
☐ (a1) Minors
☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

The computational and accounting resources of the branch are often inadequate to the demands placed on them. The objectives of this project are: to determine the needs of the branch; to identify appropriate resources; and to match resources to changing user demands.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE
NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER
Z01 RS 10240-03 BEI

PERIOD COVERED
October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Clinical Measurement of Microvascular Blood in Sickle Cell Patients

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

E.C. Walker	Chief, ACES	BEIB, DRS
G.P. Rodgers	Robert Wood Johnson Fellow	LCB, NIDDK
A.N. Schechter	Chief	LCB, NIDDK

COOPERATING UNITS *(if any)*
LCB, NIDDK

LAB/BRANCH
Biomedical Engineering and Instrumentation Branch

SECTION
Applied Clinical Engineering Section

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.6	0.5	0.1

CHECK APPROPRIATE BOX(ES)
☒ (a) Human subjects ☐ (b) Human tissues ☐ (c) Neither
☐ (a1) Minors
☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

It is commonly known that sickle cell patients possess red blood cells that have abnormal rheological properties. The cell properties affect bulk vascular flow in general and microvascular flow in particular. Severe manifestations of this disease can be observed acutely, during intensely painful crises, and chronically, as demonstrated by damage to the cardiovascular system and various organs. It is our intention to develop and explore the use of non-invasive instrumentation to study the character and degree of peripheral blood flow in stable sickle cell patients. We are currently using commercial devices to monitor non-invasively several variables. Because the devices we employ are relatively new, we will also develop a reliable means for evaluating them for potential use with our patient population.

Flow studies of this nature can lead to improved understanding of the micro-obstructive component of sickle cell disease as well as serve to evaluate potential therapies such as hydroxyurea.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER
Z01 RS 10241-03 BEI

PERIOD COVERED
October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Cisplatin Kinetics

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

P.F. Morrison	Physical Scientist	BEIB, DRS
P.J. Parsons	Research Scientist	N.Y. State Dept. Health

COOPERATING UNITS *(if any)*
New York State Department of Health

LAB/BRANCH
Biomedical Engineering and Instrumentation Branch

SECTION
Chemical Engineering

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.2	0.2	

CHECK APPROPRIATE BOX(ES)
☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Experimental and theoretical studies on the chemistry of cisplatin (DDP) have been continued with the goal of characterizing the reaction kinetics of the drug *in vitro*. Principal reactive species and pathways have been identified over the first 24 hours of drug reaction in various buffered inorganic solutions and plasma ultrafiltrates. The hydrolysis products of DDP in buffered choloride solutions have been measured for 25 hours by HPLC/electrochemical detection techniques over a pH range of 5.5 to 7.8. A kinetic model has been developed that accurately accounts for the concentration-time profiles of both parent drug and monoaquo/monohydroxo derivatives.Furthermore, the rate constant describing the reverse monoaquo to parent DDP reaction has been determined as well as the acid dissociation constant of the monoaquo/monohydroxo species. Extrapolations from this model to the pH and chloride levels found in plasma ultrafiltrate reveal that, while the relatively alkaline pH of plasma (7.4) accounts for a moderate fraction of the observed drug reactivity, pH alone does not account for all reactivity. Hence amino acid and Krebs cycle metabolites normally found in plasma have been investigated for reactivity. Histidine, methionine, and several Krebs cycle metabolites were found to be only weakly reactive or unreactive. Cysteine was found to be more reactive but exact quantitation requires further modification of the HPLC separation/detection method since cysteine/drug products coelute with monoaquo derivatives.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

ZO1 RS 10247-03 BEI

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

The Effect of Mitral Valve Replacement On Left Ventricular Geometry

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

T. L. Talbot, M.S.	ACES	BEIB, DRS
R. J. March ,M.D.		SB, NHLBI
R. E. Clark, M.D.		SB, NHLBI

COOPERATING UNITS *(if any)*

Surgery Branch, NHLBI

LAB/BRANCH

Biomedical Engineering and Instrumentation Branch

SECTION

Applied Clinical Engineering Section

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
1.0	1.0	0

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

The correction of chronic mitral insufficiency by conventional mitral valve replacement carries a higher postoperative morbidity and mortality than operations for most other valvular lesions. Clinical studies have shown that valvuloplasty performed to correct mitral insufficiency is associated with a lower morbidity and mortality than with valve replacement. It is suggested that the maintenance of the mitral apparatus (chordae tendinae) prevents enlargement of end-diastolic and end-systolic dimensions. By utilizing each ventricle as its own control, the effect of chordal severance after valve replacement on regional and global geometry was examined. Two groups of animals (chronic and acute) were compared.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10248-03 BEI

PERIOD COVERED

October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Intra-arterial Optical Evaluation

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

P.D.Smith	Physicist	BEIB, DRS
Others		
R.F. Bonner	Biophysicist	BEIB, DRS
M.B. Leon	Cardiologist	CB, NHLBI
A. Bartorelli	Clinical Assoc.	CB, NHLBI
Y. Almagor	Clinical Assoc.	CB, NHLBI

COOPERATING UNITS *(if any)*

NHLBI, MCM LABS

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Electrical and Electronic Engineering Section

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
1.0	1.0	

CHECK APPROPRIATE BOX(ES)

☒ (a) Human subjects ☐ (b) Human tissues ☐ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Evaluation of the intra-arterial wall surface is necessary for control of laser ablation of tissue. Angioscopy produces clear observation of the target sites, provided adequate irrigation of the vessel with saline solution is maintained. Precise quantitative location of the target is difficult. In addition, size constraints may limit angioscopy's usefulness in the coronary vessels.

Preliminary fluorescent observation of atheromas and normal aortic specimens from humans was performed using a fluorescence microscope with 450-490 nm excitation. Fluorescence spectra collected using a multi-channel analyzer indicated clear intensity differences between the normal and atheromatous tissue. These differences were eliminated by ablation of the atheroma by either an argon laser (514nm) or a xenon chloride (308) excimer laser.

Further fluorescent detection schemes using fiber optic probes in patients have utilized laser excitation at 325nm and 337nm, and detection from 375nm to 625nm. Realtime spectral analysis and algorithm detection of normal/abnormal arterial surfaces has been proved feasible for guiding plaque and thrombus ablation. Clinical trials of fluorescence-guided laser angioplasty are currently underway in both peripheral and coronary arteries.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE **NOTICE OF INTRAMURAL RESEARCH PROJECT**	PROJECT NUMBER ZO1 RS 10249-03 BEI

PERIOD COVERED
October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Kinetics of Folate Metabolism

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

P.F. Morrison	Physical Scientist	BEIB, DRS
C.J. Allegra	Physician	CP, NCI

COOPERATING UNITS *(if any)*
Clinical Pharmacology Branch, NCI

LAB/BRANCH
Biomedical Engineering and Instrumentation

SECTION
Chemical Engineering

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.5	0.5	

CHECK APPROPRIATE BOX(ES)
☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
☐ (a1) Minors
☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

A general folate cycle model has been completed for the MCF-7 breast cancer cell line. It consists of 21 ordinary differential equations describing the principal reactions of the folate cycle as well as those describing the glutamation, deglutamation and transport of methotrexate (MTX). Steady-state folate pools in drug-free cells have been described by adjusting Vmaxs while leaving Michaelis constants at their experimental values. By introducing observed mechanisms of inhibition and experimental inhibition constants into the model, we have found that it qualitatively reproduces folate pool dynamics during 21 hours of exposure to drug. Quantitative agreement was found if inhibition constants for $MTXglu_2$ and $MTXglu_3$ at thymidylate synthase (TS) and for dihydrofolate (FH2) and formyl-FH2 (FFH2) at glycinamide ribonucleotide and amidoimidazolecarboxamide ribonucleotide transformylases (GT and AT) are reduced within experimental uncertainty (i.e. 2-fold). Purine and thymidylate synthesis rates were found to also agree with experiment except that purine synthesis was somewhat overpredicted at exposure times between 10 to 21 hours. The folate cycle model has also been examined for its sensitivity to inclusion of enzyme activities that are cell cycle dependent. TS and dihydrofolate reductase (DHFR) were treated as periodic enzymes with S-phase activity 20-fold higher than in G-phase. The earlier model, where these activities had been represented as cycle-averaged quantities, was found to still represent folate dynamics provided (a) the rate constant describing FFH2 production from FH2 was reduced by 23% and (b) all quantities were properly averaged using G and S-phase population densities obtained from solution of a maturity-time representation of the cell cycle. S-phase cells were found to be more folate depleted at methylene tetrahydrofolate (MF) and formyl tetrahydrofolate (FFH4) than indicated by population average measurements. However, FH2 and FFH2 inhibitions at GT and AT still play a significant role since their presence is needed in the model in order to keep these pools elevated above zero, as required by experiment.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10252-02 BEI

PERIOD COVERED

October 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Physiological Monitoring System for Sepsis Models

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

E. C. Walker	Chief, ACES	BEIB, DRS
R. Corsey	Electronic Engineer	BEIB, DRS
B. Shepard	Clinical Associate	SURG, NCI
J. A. Norton	Section Chief	SURG, NCI

COOPERATING UNITS *(if any)*

SURG, NCI

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Applied Clinical Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, Maryland 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
1	1	

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

For studying the role of cachectin (Tumor Necrosis Factor -TNF) in septic shock we have developed a physiological monitoring system for laboratory rats. Temperature and direct arterial pressure were monitored.

Special carotid/aortic catheters were designed and tested for frequency response. During actual studies septic shock was induced and physiologically characterized.

Preliminary results show that findings based on assayed values of TNF are inconclusive and that additional approaches may be warranted.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10254-02 BEI

PERIOD COVERED

October 1, 1986 - September 30, 1987

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Electron Microprobe Elemental Imaging and Quantitation of Alzheimer's Associated Plaques

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

C. R. Swyt	Physical Scientist	BEIB, DRS
Others:		
H. Mori	Visiting Fellow	LNS, NIA
Q. R. Smith	Research Physiologist	LNS, NIA
S. I. Rapoport	Chief	LNS, NIA

COOPERATING UNITS *(if any)*

LNS/NIA

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Electron Beam Imaging and Microspectroscopy Group

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, Maryland 20892

TOTAL MAN-YEARS: 1.8	PROFESSIONAL: 1.8	OTHER:

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☒ (b) Human tissues ☐ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

The post-mortem distributions and concentrations of calcium, silicon, and aluminum in plaques from brains of patients with Alzheimer's disease have been determined from elemental images and spectra acquired by wavelength-dispersive x-ray spectroscopy on a computer-controlled Cameca MBX electron beam x-ray microanalyzer. Both air-dried and freeze-dried cryo-sections 8-10 micrometers thick from fresh frozen specimens with no chemical preparation were analyzed. In air-dried sections the concentrations of silicon and aluminum in the plaques were found to be similar to matrix control levels; the concentration of calcium was about fifty per cent higher in the plaques. In freeze-dried sections the concentration of silicon was the same in matrix and most plaques; the concentrations of calcium and aluminum in plaques were found to be up to ten times matrix levels. These results differ from those obtained by other workers using fixed material or purified cores. The implications are that chemical preparation significantly alters the elemental distributions in the sections.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE **NOTICE OF INTRAMURAL RESEARCH PROJECT**	PROJECT NUMBER Z01 RS 10256-02 BEI

PERIOD COVERED
October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Mechanical Prosthetic Heart Valve Tester

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

T. L. Talbot	Mechanical Engineer	DRS, BEIB
F. A. Arabia	Senior Investigator	SB, NHLBI
R. E. Clark	Chief	SB, NHLBI
S. Hilbert	Engineer	DMMS, FDA

COOPERATING UNITS *(if any)*
Cardiac Surgery Branch, NHLBI and Medical Device Group, FDA

LAB/BRANCH
Biomedical Engineering and Instrumentation

SECTION
Applied Clinical Engineering

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, Maryland 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
2.6	2.0	0.6

CHECK APPROPRIATE BOX(ES)
☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Six different manufactures' prosthetic heart valves were tested and ranked according to performance indices described by W. Swanson and S. Gabbay. Additionally, a technique was devised whereby the pressure drop across the aortic valve could be predicted by velocity measurements made with continuous wave Doppler (CWD) imaging. The results of preliminary *in vitro* studies demonstrate a high correlation ($r>0.9$) between the peak velocity as measured with CWD and the predicted velocity obtained by the application of a simplified Bernoulli equation, which uses a measured maximum pressure drop across the aortic valve. Also, an acoustical signature analysis technique is under investigation for possible non-invasive detection of partially-failed single leaflet type mechanical valves.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE **NOTICE OF INTRAMURAL RESEARCH PROJECT**	PROJECT NUMBER Z01 RS 10257-02 BEI

PERIOD COVERED
October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Analysis of Propagation of Light in Turbid Biological Tissues

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

R. F. Bonner	Physicist	BEIB, DRS
R. Nossal	Senior Research	LPS, DCRT
G. Weiss	Chief	LPS, DCRT
S. Havlin	Visiting Scientist	LPS, DCRT
T. Delaney	Senior Investigator	ROB, NCI
M. Leon	Senior Investigator	CB, NHLBI

COOPERATING UNITS *(if any)*

LPS, DCRT; Department of Physics, Bar-Ilan University, Israel

LAB/BRANCH
Biomedical Engineering and Instrumentation

SECTION
Electrical and Electronic Engineering Section

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, Maryland 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
1.0	1.0	

CHECK APPROPRIATE BOX(ES)
☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
☐ (a1) Minors
☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Many of the clinical research projects of the laser biophysics group involve the interaction of light with tissue (e.g., laser microsurgery, laser Doppler blood flow measurements, photo dynamic therapy of cancer, noninvasive platelet assessment). In order to more fully quantitate these techniques, we have undertaken theoretical modeling of light propagation in biological tissues and turbid media.

Analytical equations have been devised characterizing various parameters of photons illuminating a tissue surface (probability of surface re-emission at a given distance, mean path before re-emission, mean depth of penetration, probability of absorption with depth). These expressions have been used to interpret empirical measurements on living tissues and to quantify better a variety of clinical measurements (e.g. laser Doppler blood flow and volume measurements, dosimetry in PDT of cancer, and remote sensing of atherosclerotic plaque.

Recently our theoretical predictions of path length distributions of re-emitted photons have been applied to temporal dispersion of picosecond laser pulses in brain and muscle. Such analysis allows absolute quantitation of hemoglobin and myoglobin oxygen saturation in vivo.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10258-02 BEI

PERIOD COVERED
October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Photochemical Inactivation of Virus and Bacteria in Blood

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

R. F. Bonner	Physicist	BEIB, DRS
K. N. Prodouz	Biologist	DBBP, FDA
J. C. Fratantoni	Section Chief	DBBP, FDA
A. Russo	Section Chief	ROB, NCI

COOPERATING UNITS *(if any)*

DBBP, FDA; ROB, NCI

LAB/BRANCH
Biomedical Engineering and Instrumentation

SECTION
Electrical and Electronic Engineering Section

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, Maryland 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
1	1	

CHECK APPROPRIATE BOX(ES)
☐ (a) Human subjects ☒ (b) Human tissues ☐ (c) Neither
 ☐ (a1) Minors
 ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Photochemical sterilization of blood products is the ultimate goal of this project, in which we are quantitating photochemical destruction of virus in blood and blood products and the effects on the native blood components. Initial studies using an XeCl excimer laser characterized the response of virus and blood components as functions of cumulative fluence and peak irradiance. Single and multiple photon photochemical schemes were investigated. Single photon photochemistry resulted in an efficacious treatment range between 10-20 J/cm^2 in which a hardy virus is inactivated and platelets and plasma proteins are minimally affected. Multiple photon effects at higher irradiance led to increased protein damage in blood components without increasing efficacy of viral inactivation. Augmentation of this therapeutic window by photochemistry using exogenous agents such as riboflavin, tetracycline, and hematoporphryin derivative is being investigated .

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10259-02 BEI

PERIOD COVERED
October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Visual Target Tracking-Ability Assessment System

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

T. R. Clem, Sr.	EEES	BEIB, DRS
R. Litman, M.D.	CNSB	NIMH
T. P. Zahn, M.D.	LPP	NIMH

COOPERATING UNITS *(if any)*

CNSB, LPP, NIMH

LAB/BRANCH
Biomedical Engineering and Instrumentation

SECTION
Electrical and Electronic Engineering Section

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, Maryland 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
1	0.9	0.1

CHECK APPROPRIATE BOX(ES)
☒ (a) Human subjects ☐ (b) Human tissues ☐ (c) Neither
☐ (a1) Minors
☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Abnormal eye movements found in CNS diseases may be related to the underlying pathophysiology of a particular CNS disease. Although the oculomotor nuclei, their descending primary motor neurons, and the extraocular muscles they innervate ultimately mediate eye movements, higher centers, including premotor areas in the brainstem, midbrain, subcortical areas and cerebral cortex, are also involved in the movements. The oculomotor nuclei and neurons, together with the higher motor centers, functionally comprise five oculomotor systems responsible for different types of eye movements. Of these, the smooth pursuit eye movement system and saccadic eye movement system are of interest, for they seem to be abnormal in CNS disorders where disease in higher subcortical and cortical centers is implicated.

Both smooth pursuit and saccadic eye movements have properties that clearly distinguish them and make them easy to measure. Disorders of smooth pursuit eye movements (SPEM) have been found in schizophrenia, as well as other psychiatric disorders characterized by psychotic symptoms. Abnormal SPEM can be found in a variety of CNS illnesses, primarily those that affect the oculomotor nuclei (e.g. brainstem infarction). Abnormal SPEM and abnormalities in saccadic eye movements have also been associated with more diffuse brain diseases such as DAT, Huntington's and Parkinson's Diseases.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10260-02 BEI

PERIOD COVERED
October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Real-Time High-Performance Confocal Laser Scanning Optical Microscope

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

S. Goldstein	Chief, MES	BEIB, DRS
M. Datiles	Clinical Branch	NEI

COOPERATING UNITS *(if any)*

Clinical Branch, NEI

LAB/BRANCH
Biomedical Engineering and Instrumentation

SECTION
Mechanical Engineering Section

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, Maryland 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.8	0.7	0.1

CHECK APPROPRIATE BOX(ES)
☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
☐ (a1) Minors
☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

A new type of confocal laser scanning optical microscope has been conceived that has the potential to generate video images at TV frame rates. This scanning rate is 100 times greater than that of conventional confocal microscopes, which employ mechanical scanning; yet the new instrument is expected to retain all of the advantages of conventional confocal microscopes. Initial use will involve optical sectioning of corneas. An anticipated application is low-level fluorescence microscopy. Major components are complete and system integration and preliminary testing are underway.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10262-02 BEI

PERIOD COVERED

October 1, 1986 - September 30, 1987

TITLE OF PROJECT (80 characters or less. Title must fit on one line between the borders.)

Hemodynamic Models for Catheter Studies

PRINCIPAL INVESTIGATOR (List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)

R. J. Lutz DRS, BEIB

Others:

R. L. Dedrick	DRS, BEIB	D. Miller	CC, DR
J. Collins	CC, CNS	J. Doppman	CC, DR
S. Saris	NINCDS, IR, SN	J. Tweed	NINCDS, IR, SN
K. Van Boskirk	DRS, BEIB	M. Stout	DRS, BEIB

COOPERATING UNITS (if any)

NINCDS, CC

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Chemical Engineering Section

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, Maryland 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
3.0	2.0	1.0

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither

☐ (a1) Minors

☐ (a2) Interviews

SUMMARY OF WORK (Use standard unreduced type. Do not exceed the space provided.)

Physical models of vascular systems have proven to be very useful tools for studying hemodynamic events that occur during the use of catheters. Our investigations with *in vitro* flow models have included (1) mixing studies in a hepatic model using a prototype balloon catheter that infused dye solutions through side holes proximal to the balloon at the rate of 1.4ml/min, (2) studies in a hepatic model that investigated the effect of infusion rates (in the range from 1ml/hour to 20 ml/min) on mixing from an end hole catheter placed in the gastroduodenal artery, (3) mixing studies in a carotid artery model during ultra-slow infusion (4ml/day) from an Infusaid pump, (4) investigation of a novel balloon catheter with a built-in ultrasonic, pulsed-Doppler crystal in the tip intended to monitor intra-lumenal flow rates, and (5) studies in large-vein flow models of the use of multilumen catheters during simultaneous infusions of incompatible drugs.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE **NOTICE OF INTRAMURAL RESEARCH PROJECT**	PROJECT NUMBER Z01 RS 10267-02 BEI

PERIOD COVERED
July 30, 1987 - July 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
A Low-Noise Electrometer for an Automated Hemoglobin Oxygen Equilibrium Curve Measurement System

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

H. E. Cascio	Electr. Eng.	BEIB, DRS
R. L. Berger	Physicist	LTD, NHLBI
K. O. Kalmbach	Eng. Tech.	LTD, NHLBI

COOPERATING UNITS *(if any)*
LTD, NHLBI

LAB/BRANCH
Biomedical Engineering and Instrumentation

SECTION
Electrical and Electronic Engineering

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, Maryland 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.8	0.4	0.4

CHECK APPROPRIATE BOX(ES)
☐ (a) Human subjects ☒ (b) Human tissues ☐ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Measurement of the hemoglobin oxygen equilibrium curve (OEC) in an automated system is hampered by noise. To obtain reliable results in reading partial pressures in the range of 0.01 mmHg requires special techniques in electronic circuit design. The pO_2, pH, and the pCO_2 electrodes have very high internal resistance with very low output signal levels. When these devices are used in an environment contaminated by radiofrequency interference (RFI) from a computer, the magnetic fields of stepping motors, as well as power line transients generated by a high current water bath, the electrode output leads must be kept short and shielded. The electrode signals must be kept scaled and offset by a computer-controlled signal processor that properly interfaces these measured voltages to an AT-type personal computer, for further software analysis. Another task to be performed is the designing and fabrication of the required circuitry for the development of the automated system to perform the required measurements.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10269-02 BEI

PERIOD COVERED

October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Physiologic Study of High Altitude Sherpas at Their Homes

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

C. Gibson	Electronics Engineer	EEES, BEIB, DRS
D. Blume	Biologist	State College of Los Angeles
R. Winslow	Director	Chief Lair, Presidio of San Francisco

COOPERATING UNITS *(if any)*

State College of LA

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Electrical and Electronics Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, Maryland 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.4	0.3	0.1

CHECK APPROPRIATE BOX(ES)

☒ (a) Human subjects ☐ (b) Human tissues ☐ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

A set of equipment was assembled and shipped to Kunde, Nepal (alt. 13,600 ft) to do the following tests: physical examinations, sleep studies with staging, water balance studies, ANF studies, spirometry, complete blood counts (CBCs), blood viscosities, 2-3 DPGs, blood pH, osmotic fragilities, Hb, MethHb, COHb, oxygen equilibrium curves on whole blood, and a ramp and steady state exercise test using breath-by-breath analysis.

Thirty subjects living at high altitude (13,600 ft) were studied in 8 weeks and data analysis is now being done.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE
NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER
Z01 RS 10270-02 BEI

PERIOD COVERED
October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Computer-Assisted Analysis of M-Mode Echocardiograms

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

M. Unser	Visiting Associate	BEIB, DRS
M. Eden	Chief	BEIB, DRS
G. Pelle	Chargé de recherche	Unité 138, INSERM
P. Brun	Chief	Unité 138, INSERM

COOPERATING UNITS *(if any)*
Unité 138, INSERM

LAB/BRANCH
Office of the Chief

SECTION
Biomedical Engineering and Instrumentation

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, Maryland 20892

TOTAL MAN-YEARS: 1.0
PROFESSIONAL: 1.0
OTHER:

CHECK APPROPRIATE BOX(ES)
☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
☐ (a1) Minors
☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Echocardiography is a non-invasive method for monitoring ventricular function and evaluating myocardial hypertrophy in patients with heart disease. Although the information displayed in two-dimensional echocardiograms is generally the most useful for diagnostic purposes, one-dimensional or M-Mode echocardiography, due to its greater reliability, is widely accepted as the reference method for the evaluation of myocardial wall thickness.

To facilitate quantitative assessment and to minimize potential errors, we have developed two computational approaches allowing the automated extraction of myocardial borders.

The first technique uses a set of predefined matched filters to enhance border characteristics. The extraction of cardiac boundaries is achieved by determining optimal paths along the time direction.

The second approach uses a radically different strategy. It computes an estimate of an elastic deformation (warping) function allowing the mapping of a measurement obtained at a given time (t) onto a reference signal. The knowledge of the spatial deformation as a function of time allows the determination of the trajectory of any reference point during the cardiac cycle.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10271-01 BEI

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Strain Rate Dependency of Wound Breaking Strength

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

T. L. Talbot, M.S.	ACES	BEIB, DRS
D.T. Cromack, M.D.		NCI, SB
J. A. Norton, M.D.	Chief	NCI, SB

COOPERATING UNITS *(if any)*

Surgery Branch, NCI

LAB/BRANCH

Biomedical Engineering and Instrumentation Branch

SECTION

Applied Clinical Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.25	0.2	0.05

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
- ☐ (a1) Minors
- ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

This section has been involved in wound healing studies for the past decade. The primary measurement which these studies make is the wound breaking strength of a dermal wound at various stages of the healing process. Multiple modalities and healing interventions have been employed which were hoped to enhance the healing of normal wounds or to minimize the deleterious effects on healing which many chemotherapeutic agents effect. Currently there is a burgeoning amount of research in the area primarily as a result of the availability of relatively low cost growth factors which have been synthesized through the employment of recombinant techniques. Unfortunately, cross-study comparisons are difficult to interpret because of the strain rate dependency of the wound breaking strength. The literature has reported extension rates varying from one to thirty centimeters per minute.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10272-01 BEI

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Photometry for Photo-Dynamic Therapy

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

W.S. Friauf	Chief, EEES	BEIB, DRS
Others:		
C. Gibson	Elect. Engr.	BEIB, DRS
P.D. Smith	Physicist	BEIB, DRS
R.F. Bonner	Biophysicist	BEIB, DRS
A. Russo	Section Chief	ROB, NCI
T. Delaney	Clinical Assoc.	ROB, NCI
H. Pass	Surgeon	SURG., NCI

COOPERATING UNITS *(if any)*

ROB, NCI, and SURG, NCI

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Electrical and Electronic Engineering Section

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.4	0.4	

CHECK APPROPRIATE BOX(ES)

☒ (a) Human subjects ☐ (b) Human tissues ☐ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Dosimetry for photodynamic therapy (PDT) involves measurement of hematoporphyrin derivative (HPD) concentration, oxygen concentration, singlet oxygen concentration, and therapeutic light level, all as a function of position throughout the tissue being treated intentionally or unavoidably. Non-invasive measurements are essentially limited to surfaces, although theoretical and empirical models can be used to estimate values some distance into the tissue. Fiber optic probes can be used for direct sub-surface measurements.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE **NOTICE OF INTRAMURAL RESEARCH PROJECT**	PROJECT NUMBER Z01 RS 10273-01 BEI

PERIOD COVERED

October 1, 1987 - September 30, 1988

TITLE OF PROJECT (80 characters or less. Title must fit on one line between the borders.)

A Continuum Model to Predict the Dynamics of a Hydrogel Strip

PRINCIPAL INVESTIGATOR (List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)

Piero Chiarelli, Dott.	Visiting Fellow, MES	BEIB, DRS
Peter Basser, Ph.D.	Staff Fellow, MES	BEIB, DRS

COOPERATING UNITS (if any)

None

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Mechanical Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.8	0.8	

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK (Use standard unreduced type. Do not exceed the space provided.)

A hydrogel strip exhibits stress-relaxation when stretched. The decay in tensile stress can be ascribed primarily to strain-induced swelling of the polymer network. This assertion is formalized in a bi-phasic continuum model of the gel-solvent system. An equation of motion, a linear constitutive law of the polymer network, Darcy's law and the conservation of mass of the network constituents and interstitial fluid are all solved with boundary and initial conditions appropriate for a stress-relaxation experiment. The model predicts the evolution and distribution of the interstitial fluid pressure, elastic stress, total tensile stress, and isometric force applied to the clamp during the course of a stress-relaxation experiment. It also predicts that the stress-relaxation time constant depends inversely upon the square of the thickness of the gel strip - a non-intuitive result that is confirmed by experiment.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10274-01 BEI

PERIOD COVERED

October 1, 1987 - September 30, 1988

TITLE OF PROJECT (80 characters or less. Title must fit on one line between the borders.)

A Non-invasive Method to Measure Tissue Stress

PRINCIPAL INVESTIGATOR (List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)

Peter Basser, Ph.D.	Staff Fellow, MES	BEIB, DRS
John Eng	Hughes Fellow	LKEM, NIHLB
Robert Balaban, Ph.D.	Section Chief	LKEM, NIHLB

COOPERATING UNITS (if any)

SN/NINCDS

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Mechanical Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.4	0.4	

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither

☐ (a1) Minors

☐ (a2) Interviews

SUMMARY OF WORK (Use standard unreduced type. Do not exceed the space provided.)

Elevated levels of mechanical stress reduce perfusion and induce structural damage in tissue. The purpose of this invention is to provide a method to determine the normal component of tissue stress by measuring the stress it applies to surrounding tissue. The contact stress* sensor consists of a flexible bag containing a polyelectrolyte gel and an NMR pH indicator. Normal stress applied to the bag is transmitted to the spongy gel, squeezing interstitial fluid into the surrounding bath. Compressing the gel increases its charge density, forcing a new intracellular and extracellular equilibrium pH distribution. The applied stress is inferred from a non-invasive NMR spectroscopic measurement of pH. Since no external connections are required, it is expected that a sterile field can be maintained. In addition, a potential exists for long-term stability. The sensor contains no cytotoxic substances or non-toxic chemicals in non-physiologic concentrations whose release would also present a threat to surrounding biological tissue. The stiffness of the gel can be changed by altering its polymer content allowing the operating range and sensitivity of the sensor to be controlled.

*N.B. Contact pressure is defined as the normal component of the interfacial stress between two bodies in contact with one another; it is not the ambient isotropic normal stress known as hydrostatic pressure.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10275-01 BEI

PERIOD COVERED

October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

A Method to Measure Mechanical Constants of a Hydrogel

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

Peter Basser, Ph.D.	Staff Fellow, MES	BEIB, DRS
Piero Chiarelli, Dott.	Visiting Fellow, MES	BEIB, DRS

COOPERATING UNITS *(if any)*

None

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Mechanical Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.7	0.7	0.0

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

A method has been developed to measure rapidly and accurately three important material constants of a hydrogel sample. The shear modulus, m, the bulk modulus, k, and the hydraulic permeability, 1/f can be determined from a single stress-relaxation experiment. The material constants are treated as free parameters whose values are optimally estimated by minimizing the variance between predicted and empirical force relaxation waveforms. Values of the three constants obtained by this method agree with values obtained by independent free-swelling and permeability measurements.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10276-01 BEI

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Microdialysis Probe Studies

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

R.L. Dedrick	Chemical Engineer	BEIB, DRS
P.F. Morrison	Physical Scientist	BEIB, DRS
P.M. Bungay	Chemical Engineer	BEIB, DRS
J.K. Hsaio	Psychiatrist	LCS, NIMH
I.N. Mefford	Chemist	LCS, NIMH
K.S. Bankiewicz	Neurosurgeon	SNB, NINCDS

COOPERATING UNITS *(if any)*

Lab. Clinical Science, NIMH; Surgical Neurology Br., NINCDS

LAB/BRANCH

Biomedical Engineering and Instrumentation Branch

SECTION

Chemical Engineering Section

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.5	0.5	

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Microdialysis probe technology provides a means for sampling diffusible tissue extracellular constituents. However, the relationship of the probe effluent concentrations to their tissue counterparts is a complex function of solute molecular weight, solute physicochemical properties, tissue properties, probe membrane properties, probe geometry and perfusion rate, and the trauma of probe insertion into the tissue. These dependencies will be studied in order to improve the quantitative usefulness of the technology. The focus of applications is the brain in connection with Parkinson's disease and transplant therapy. Solutes of particular interest are dopamine and its metabolites. Approaches considered include mathematical modeling of solute transport within the probe and surrounding medium with both in vitro and in vivo validation experiments.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10277-01 BEI

PERIOD COVERED

July 30, 1987 - July 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Technical Assistance for Television Use In Research

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

H. E. Cascio	Electr. Eng.	BEIB, DRS
P.D. Smith	Physicist	BEIB, DRS
N. L. Ostrowski	Staff Fellow	NIMH, LCM
S. Stanhope	Biomechanics Laboratory	CC

COOPERATING UNITS *(if any)*

NIMH, LCM and Biomechanics Laboratory, CC

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Electrical and Electronic Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.2	0.2	

CHECK APPROPRIATE BOX(ES)

☒ (a) Human subjects ☐ (b) Human tissues ☐ (c) Neither

☐ (a1) Minors

☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Television systems have become an integral part of many scientific and medical research studies at the NIH. The implementation of a television system demands adherence to rigid standards for system interconnections and adjustments. Technical assistance such as system design and consultation is provided to the Intramural Research Program by the EEES of the BEIB. Consultations range from assistance in selecting system components such as cameras, associated electronics, and lenses to solving problems of an existing system. Typical examples were with Dr. Nancy Ostrowski and Dr. Steven Stanhope.

Dr. Ostrowski was having problems performing studies on brain receptors using a SDS Autoradiographic Image Analyzer. The system has a vidicon camera, which has poor electronic stability, causing difficulty in comparing different brain studies. Dr. Stanhope has a Vicon six camera computer operated motion analysis system for the acquisition and evaluation of data associated with patient function. The video system detects the presence of reflective markers located on the patient and by software, calculates the three dimensional location of each marker. The problems with persistence, blooming, and electronic stability of the vidicon makes the balancing of the six cameras very difficult. The solution for both problems is to replace the vidicon cameras with CCD cameras. The CCD cameras have superior electronic stability and do not display picture smearing when detecting fast motion.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10278-01 BEI

PERIOD COVERED

October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Liquid Radioactive Waste Disposal Control System

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

T. R. Clem, Sr.	EEES	BEIB, DRS
Other Investigators:		
Roger W. Broseus	RSB	ORS, OD

COOPERATING UNITS *(if any)*

RSB, ORS, OD

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Electrical and Electronic Engineering Section

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, Maryland 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
1	0.9	0.1

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
- ☐ (a1) Minors
- ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

A new liquid radioactive waste disposal system has been installed at the NIH. At present, each valve has a separate control switch and light indicating fully open or fully closed status. To fill or empty any one of the nine 2250-gallon storage tanks requires the operation of a sequence of switches. A control system is being designed and built that will allow fill and drain operations to be accomplished through the actuation of one switch, subject to the satisfaction of several conditions that will allow only safe material to be dumped and only by authorized personnel. The system will also provide additional fail-safe functions and system status information reporting as well as automatically keeping a log of all operations.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10279-01 BEI

PERIOD COVERED

October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Kinetics of Erythrocyte Sickling in Physiological Conditions

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

Alec Eidsath	Biomedical Engineer	BEIB, DRS
William Eaton	Acting Chief, LCP	LCP, NIDDKD
James Hofrichter		LCP, NIDDKD

COOPERATING UNITS *(if any)*

Laboratory of Chemical Physics, NIDDKD

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Mechanical Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.3	0.3	0.0

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☒ (b) Human tissues ☐ (c) Neither

- ☐ (a1) Minors
- ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

We plan to build a flow cell in which the partial pressure of oxygen can be varied rapidly in order to study sickling under conditions that more resemble physiological conditions than have been used in the past. Since there is a broad distribution in the cellular hemoglobin concentration, a large number of cells need to be analyzed simultaneously. The change in shape of the cells in the flow cell will be observed under a microscope. A video camera will transmit the picture to a computer, where the fraction of cells that have sickled will be automatically determined using image analysis algorithms.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10280-01 BEI

PERIOD COVERED

October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Quantitative Detection of Electroenecephalogram Spikes and Seizures

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

A. Markowitz	Electrical Engineer	ACES, BEIB, DRS
B. Chidakel	Electronic Technician	RIS, BEIB, DRS
M. Rogawski	Senior Investigator	NINCDS, MNB

COOPERATING UNITS *(if any)*

NINCDS, MNB

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Applied Clinical Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.3	0.2	0.1

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

A system was designed to obtain real-time measurements for automatic quantification of Electroencephalogram (EEG) spikes and seizures. The EEG spikes were amplified, filtered and monitored by a counter/timer in a microcomputer data acquisition system. The number of spikes per preselected unit of time was collated, stored, analyzed and displayed.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10281-01 BEI

PERIOD COVERED

October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Measurement of Membrane Ionic Channels in Chromaffin Cells

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal investigator.) (Name, title, laboratory, and institute affiliation)*

A. Markowitz	Electrical Engineer	ACES, BEIB, DRS
B. Chidakel	Electronic Technician	RIS, BEIB, DRS
T. Tedder	Mechanical Technician	RIS, BEIB, DRS
A. Stutzin	Visiting Scientist	LCBG, NIDDKD
E. Rojas	Biophysicist	LCBG, NIDDKD

COOPERATING UNITS *(if any)*

LCBG, NIDDKD

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Applied Clinical Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS: 1.2	PROFESSIONAL: 0.4	OTHER: 0.8

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
- ☐ (a1) Minors
- ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Instrumentation and analysis have been developed for the measurement of ionic currents in the bovine chromaffin cell using whole cell and single channel recording. Instrumentation includes a current-to-voltage converter, an AT microcomputer system, a PACE computer system, voltage stimulator, filter, and threshold detector.

Measurements of event durations and event amplitudes for different membrane potentials and appropriate inhibitory drugs (example: muscarine) were performed on the collected data. The events were collated and then fit to appropriate functions that characterized the population.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10282-01 BEI

PERIOD COVERED

October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Multi-User System for Quality Control of Injected Short-Lived Radionuclides

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

A. Markowitz	Electrical Engineer	ACES, BEIB, DRS
B. Chidakel	Electronic Technician	RIS, BEIB, DRS
T. Tedder	Mechanical Technician	RIS, BEIB, DRS
M. Green	Physicist	NM, CC

COOPERATING UNITS *(if any)*

NM, CC

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Applied Clinical Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.3	0.2	0.1

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither

☐ (a1) Minors

☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

A microcomputer-based system that permits the decaying value of the radionuclide in a syringe to be continuously displayed in the patient imaging area after a single calibration is performed in radiopharmacy.

This design involves the conversion of a single-user system in the Scanditronix imaging area to a multi-monitor, multi-user system to work simultaneously on patients in the Neuropet, Scanditronix and Posicam imaging areas.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10283-01 BEI

PERIOD COVERED

October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

A Micro-Computer Based Flow Cytometry Data Collection and Analysis System

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

C.P. Mudd	Biomedical Engineer	ACES, BEIB, DRS
J. A. Dvorak	Researcher	LPD, NIAID

COOPERATING UNITS *(if any)*

LPD, NIAID

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Applied Clinical Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.2	0.2	0.0

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
☐ (a1) Minors
☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Traditionally, minicomputers have been used for the collection and analysis of data generated by flow cytometers. One reason is that, until recently, microcomputers, which would be more cost-effective alternatives, were not sufficiently developed to satisfy the unique demands imposed by flow cytometers. In order to overcome some of the deficiencies of early generations of microcomputers, several of the functions required for data collection, such as analog to digital conversion and data storage in static RAM have been performed "external" to the computer which was used for the data analysis. In addition, "mixed" flow cytometry systems in which data are collected with a minicomputer and analyzed with a microcomputer have been developed. However, these approaches are not cost effective and do not effectively use the improved capabilities of available microcomputers. With the evolution of the Intel 80XXX family of processors, reliable peripherals, and a variety of powerful compilers, it has become feasible to develop a relatively inexpensive microcomputer-based data collection and analysis system for flow cytometry that performs as well as, or better than, minicomputer-based systems.

The key link between the flow cytometer and the microcomputer is the electronic interface system that collects, processes, and conditions the analog signals from the preamplifiers of the four detectors. We have developed such a system, effectively solving the problem of interfacing asynchronous and synchronous data conversion, acquisition and storage. The interface system operates in a "handshake" fashion with the microcomputer. After initialization or the completion of data storage by the microcomputer, the interface module resumes control from the microcomputer, resets itself to clear the previous reading, and waits for the passage of the next cell through the flow cytometer. When a cell is detected, the interface module integrates the four analog signals for 20-35 microseconds, holds the value, and sends a "data ready" signal to the microcomputer, which then resumes control, reads the four integrated values, stores them in RAM, updates the real-time data display, and returns control to the interface module. The performance of the system has validited using microcomputers. With standardized beads, we obtained histograms with CV's (coefficients of variation) of 1.6%.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10284-01 BEI

PERIOD COVERED

October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Measurement of the Binding Heats of Oxygen to Hemoglobin

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

C.P. Mudd	Biomedical Engineer	ACES, BEIB, DRS
R.L. Berger	Chemist	LTD, NHLBI

COOPERATING UNITS *(if any)*

LTD, NHLBI

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Applied Clinical Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.1	0.1	0.0

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☒ (b) Human tissues ☐ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

The binding of oxygen to hemoglobin is thought to be a multistep process with different rate constants for each step. With an all tantalum stopped-flow calorimeter developd earlier, we can easily measure the heat of binding of oxygen to hemoglobin. The all tantalum system will prevent the diffusion of oxygen into the system and will allow us to measure these heats over the entire saturation range, 0-100%; preliminary measurements of the binding heat at 50% saturation are in good agreement with published values.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10285-01 BEI

PERIOD COVERED

October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Determination of Binding Enthalpies of Anthracycline Drugs to DNA Host Cells

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

C.P. Mudd	Biomedical Engineer	ACES, BEIB, DRS
K.L. Breslauer	Chemist	Rutgers University
D.P. Remeta	Chemist	Rutgers University

COOPERATING UNITS *(if any)*

Department of Chemistry, Rutgers University

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Applied Clinical Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.1	0.1	0.0

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

The first set of measurements of the drug binding enthalpies for daunomysin to DNA in the 10-20 micromolar range (where the monomeric form predominates) have been made. These results were presented in a poster session at the 1988 meeting of the Biophysical Society. The enthalpies at these concentrations were in the 30-50 microjoule range. With a tantalum stopped flow calorimeter, we were able to measure 120 of these reactions per day with an uncertainty of only 3 microjoules. We anticipate two more sets of experiments to explore the salt and temperature dependence of the enthalpies. The experiments are being performed in collaboration with the Department of Chemistry at Rutgers University.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE **NOTICE OF INTRAMURAL RESEARCH PROJECT**	PROJECT NUMBER Z01 RS 10286-01 BEI

PERIOD COVERED
October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
High Speed Differential Stopped Flow Calorimeter

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

C.P. Mudd	Biomedical Engineer	ACES, BEIB, DRS
R.L. Berger	Chemist	LTD, NHLBI

COOPERATING UNITS *(if any)*

LTD, NHLBI

LAB/BRANCH
Biomedical Engineering and Instrumentation

SECTION
Applied Clinical Engineering

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.2	0.2	0.0

CHECK APPROPRIATE BOX(ES)
☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
☐ (a1) Minors
☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

A preliminary single channel, high speed, stopped-flow calorimeter has been constructed to evaluate mixing speeds, flow velocities, pressure drops, and thermal detection sensitivity. The system uses a variable speed flywheel and electrically actuated clutch to transfer sufficient energy to the two drive syringes to mix reagent volumes of 200 microliters in 10 milliseconds or less. The inlet tubes from the drive syringes, as well as the mixer and the detection chamber are kept at constant temperature between 25 and 50 deg C. An ultra-fast thermistor (1 ms) is located in the detection chamber to measure the temperature rise during the reaction. The detection chamber also contains a quartz observation tube for optical measurement of the reaction.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10287-01 BEI

PERIOD COVERED

October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Differential Scanning Calorimeter

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

C.P. Mudd	Biomedical Engineer	ACES, BEIB, DRS
R.D. Ross	Physical Chemist	LMB, NIADDK

COOPERATING UNITS *(if any)*

LMB, NIADDK

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Applied Clinical Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.2	0.2	0.0

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
- ☐ (a1) Minors
- ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

The application of sensor design and modelling techniques from earlier work in differential heat conduction calorimeters to DSC (Differential Scanning Calorimetry) has produced a prototype DSC with a 10 fold increase in effective sensitivity. The prototype was placed in service and evaluated in late 1985. After several months, noise problems developed that were traced to the sensors. Since these sensors are designed and manufactured for use as heat pumps (Peltier mode of operation) and not sensors (Seebeck mode of operation), the manufacturer could not supply information on noise performance. We then initiated a program to evaluate the noise and failure modes of sensors from several different manufacturers. One noise source was traced to mechanical failures in the thermocouple elements caused by large stresses developed across the thermopile when the calorimeter temperature was ramped from 30 deg C to 80 deg C. These stresses were created by the "sandwich" type mounting of the sensors together with a mismatch in the coefficients of thermal expansion. A new mounting design allows the sensors to "float" thus minimizing stresses as the temperature changes. The screening procedure and new mounting scheme reduced the noise to a level one fourth that of a commercial DSC. In a complete analysis of noise sources in the DSC however, we found that the noise contribution from the sensors is still approximately five times larger than any other noise source in the system. Thus, a significant reduction in the system noise is still possible if the sensor noise can be reduced further.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10288-01 BEI

PERIOD COVERED

October 1, 1987 - September 30, 1988

TITLE OF PROJECT (*80 characters or less. Title must fit on one line between the borders.*)

Television Tracking of Beating Myocardial Cells *In Vitro*

PRINCIPAL INVESTIGATOR (*List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

C.P. Mudd	Biomedical Engineer	ACES, BEIB, DRS
T.L. Talbot	Mechanical Engineer	ACES, BEIB, DRS
J.E. Parrillo	Chief	CCMB, CC

COOPERATING UNITS (*if any*)

CCMB, CC

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Applied Clinical Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.1	0.1	0.0

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
- ☐ (a1) Minors
- ☐ (a2) Interviews

SUMMARY OF WORK (*Use standard unreduced type. Do not exceed the space provided.*)

A preliminary, closed-loop, television tracking system has been developed to measure the motion of beating mouse myocardial cells *in vitro*. The performance of these cells is used to monitor the presence of circulating myocardial depressant substances present in the blood serum of patients with septic shock. The beating cells are placed in a petri dish which is mounted in an inverted microscope. The cells are flushed with a solution of 4 micron latex spheres which adhere to the cell walls. Due to the differences in the indices of refraction between the solution and the spheres, the spheres appear dark in the microscope field. A miniature CCD (charge coupled device) television camera is used to display the image from the microscope on a television monitor. An electronic targeting circuit superimposes a "target window" on the monitor. The petri dish is scanned by the operator to select a target bead moving with a cell. The camera is then rotated until the bead is moving horizontally along the television raster lines. The X-Y manipulators on the microscope are used to locate the moving bead in the displayed target window. At this point, the track switch is closed to complete the feedback loop and the target window "locks" onto the bead. The error voltages generated to track the bead are a measure of the displacement of the beating cell. After a control run, serum from a patient is added to the medium surrounding the cells and the activity monitored. If a myocardial depressant factor is present, the beating of the cells is affected. A portion of each run is sampled and stored by a microcomputer.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10289-01 BEI

PERIOD COVERED

October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Tantalum Batch Calorimeter for *In Vitro* Cell Studies

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

C.P. Mudd	Biomedical Engineer	ACES, BEIB, DRS
R.L. Berger	Chemist	LTD, NHLBI

COOPERATING UNITS *(if any)*

LTD, NHLBI

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Applied Clinical Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS: 0.1	PROFESSIONAL: 0.1	OTHER: 0.0

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

In biological experiments, it is often desirable to monitor the heat output of in vitro cell preparations as nutrients, drugs, etc., are added to the preparation. In addition, the measurement of temperature, p02, pC02, and pH is very useful. To meet these needs, we have designed a new type of heat conduction batch calorimeter. The instrument has two, large (5 ml) tantalum cells arranged in a differential configuration. Each cell has provision to accommodate 6, 1 mm O.D. fluid delivery lines or fiber optic sensor lines. The heat production of the cell preparation is detected using a scheme similar to that used in our earlier batch calorimeters. The cell temperature can be set between 4 deg C and 50 deg C.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10290-01 BEI

PERIOD COVERED

October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Prevention of Electrosurgical Burns to Infant Monkeys During Brain Surgery

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

R. Corsey	Electronic Engineer	BEIB, DRS
J. Desavalier	Clinical Associate	LN, NIMH
R. Desimone	Senior Investigator	LN, NIMH

COOPERATING UNITS *(if any)*

LN, NIMH

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Applied Clinical Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.3	0.3	0.0

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
 ☐ (a1) Minors
 ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

During brain surgery several newborn monkeys have received severe burns on the legs. During this study we intend to investigate an optimal power setting of the electrosurgical machine and consider changes in the holding mechanism for the monkeys. A complicating factor is the desire to avoid shaving hair as is done with human patients. To overcome this difficulty we plan to use several return electrode and electrode gel combinations to present a low resistance interface.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE NOTICE OF INTRAMURAL RESEARCH PROJECT	PROJECT NUMBER Z01 RS 10291-01 BEI

PERIOD COVERED
October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Determination of Optimal Electrosurgical Power Settings to Prevent Burns During Laparoscopic Procedures

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

R. Corsey	Electronic Engineer	BEIB, DRS
M. Evans	Environmental Safety Officer	OD, CC
J. Boone	Quality Assurance Coordinator	OD, CC

COOPERATING UNITS *(if any)*
OD, CC

LAB/BRANCH
Biomedical Engineering and Instrumentation

SECTION
Applied Clinical Engineering

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.5	0.5	0.0

CHECK APPROPRIATE BOX(ES)
☒ (a) Human subjects ☐ (b) Human tissues ☐ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

The acquistion of powerful electrosurgical generators in the operating room has established the need for new guidelines to prevent patient injuries. Laparocopic procedures require very little electrosurgical energy in contrast with many other operative procedures. A burn to a patient's gastro-intestinal tract by a surgeon from an institution other than NIH emphasizes the need for reexamination of power setting guidelines for new-generation electrosurgical machines. Current guidelines were established in the early and mid nineteen seventies when electrosurgical machines were not nearly as powerful. We will measure the power output of the new-generation electrosurgical machines and establish recommendations for power settings for laparoscopic procedures. Clinical experence and guidelines of the American Association of Gynecologic Laparoscopists will be incorporated.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE **NOTICE OF INTRAMURAL RESEARCH PROJECT**	PROJECT NUMBER Z01 RS 10292-01 BEI

PERIOD COVERED

October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

The Use of Facial Cooling to Improve the Condition of Mentally Depressed Patients

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

R. Corsey	Electronic Engineer	BEIB, DRS
E. Souetre	Clinical Associate	CPB, NIMH
T. Wehr	Branch Chief	CPB, NIMH

COOPERATING UNITS *(if any)*

CPB, NIMH

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Applied Clinical Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
2.0	2.0	0.0

CHECK APPROPRIATE BOX(ES)

☒ (a) Human subjects ☐ (b) Human tissues ☐ (c) Neither
- ☐ (a1) Minors
- ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Patients with unipolar or bipolar affective disorder (depression) have been shown to have abnormally high nighttime temperatures. We hypothesize that elevated body temperature may be responsible for several alterations in depression such as reduced thyropin secretion. Procedures such as selective rapid eye movement (REM) sleep, total sleep deprivation, and administration of drugs such as tricyclic antidepressants appear to reduce brain temperature. We believe the antidepressant effects of these agents are related to their capacity to reduce brain temperature. Further, direct or indirect cooling of the brain might have antidepressant effects. We will test our hypothesis by cooling the face, which will cool the brain through countercurrent heat exchange with venous blood.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10293-01 BEI

PERIOD COVERED

October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Determination of Pressure Patterns of Injected Chemotherapeutic Drugs

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

R. Corsey	Electronic Engineer	BEIB, DRS
E. Berstein	Staff Fellow	ROB, NCI
A. Russo	Section Chief	ROB, NCI

COOPERATING UNITS *(if any)*

ROB, NCI

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Applied Clinical Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
1.5	1.5	0.0

CHECK APPROPRIATE BOX(ES)

☒ (a) Human subjects ☒ (b) Human tissues ☐ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Studies of intraneoplastic injection of chemotherapeutic agents have shown an advantage for injection over intravenous or intraperitoneal administration. Intratumor injections are usually characterized by specifying the depth of needle penetration or merely indicating injections are subcutaneous. This study will explore the affect of varying injection pressure from bolus injection over a short time period to easily assimulated injection over a half hour or more. Various injection orifice structures will also be explored through the use of tumor models and dye injection.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10294-01 BEI

PERIOD COVERED

October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Determination of Acceptability of Insulated Ground Electrical Receptacles in ICUs

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

R. Corsey	Electronic Engineer	BEIB, DRS
M. Harris	Mechanical Engineer	OD, CC
C. Strong	Environmental Safety Officer	OD, CC

COOPERATING UNITS *(if any)*

OD, CC

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Applied Clinical Engineering

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.5	0.5	0.0

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Insulated ground electrical receptacles are specially constructed to provide a "clean" ground for computer equipment and other equipment which may be adversely affected by spurious electromagnetic radiation. The offending electrical signals are thought to be transmitted through the air and through conductors connected to the building ground. Insulated ground receptacles impose an insulator between the equipment ground and the building ground structure to keep electrical noise from passing from the building ground to the equipment grounded. The insulator eliminates the redundant grounding regular receptacles provide and may be thought of as lowering the degree of safety. This may not be tolerable in critical care areas of the hospital such as ICU's and operating rooms. This study will investigate the noise advantages and the safety disadvantages of insulated ground receptacles.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE **NOTICE OF INTRAMURAL RESEARCH PROJECT**	PROJECT NUMBER Z01 RS 10295-01 BEI

PERIOD COVERED
October 1, 1987 - September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Establishment of a Low Electrical Noise Environment for Electrooculography Studies

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and Institute affiliation)*

R. Corsey	Electronic Engineer	BEIB, DRS
R. Caruso	Senior Investigator	CB, NEI

COOPERATING UNITS *(if any)*
CB, NEI

LAB/BRANCH
Biomedical Engineering and Instrumentation

SECTION
Applied Clinical Engineering

INSTITUTE AND LOCATION
DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
1.0	0.9	0.1

CHECK APPROPRIATE BOX(ES)
☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
☐ (a1) Minors
☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

In response to an NEI request a technician with the Division of Engineering Services installed an isolated power system in an NEI room to provide for low electrical noise measurements. The installation did not meet national code requirements and did not reduce electrical noise sufficiently. This study provided methodology to upgrade the installation to meet code requirements and will provide alternatives to improve the noise performance. The noise problem is being approached by monitoring the power line and improving power line conditioning.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10296-01 BEI

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Experiments with a High Resolution Field-Emission STEM

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

R.D. Leapman	Physical Scientist	BEIB DRS
C.E. Fiori	Physical Scientist	BEIB DRS
C.R. Swyt	Physical Scientist	BEIB DRS
D.E. Newbury	Physical Scientist	Div. Analyt. Chem. NBS

COOPERATING UNITS *(if any)*

Analytical Chemistry Division, NBS

LAB/BRANCH

Biomedical Engineering and Instrumentation Branch

SECTION

Electron Beam Imaging and Microspectroscopy Group

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.5	0.5	

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither

- ☐ (a1) Minors
- ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

A Vacuum Generators HB501 field emission scanning transmission electron microscope has been installed and tested. The resolution in bright-field and dark-field has met specifications. It has been possible to image the graphite 3.4 angstrom (0001) lattice fringes and the gold 2.04 angstrom (100) lattice fringes in bright-field. This test necessitated modifications to the microscope room to reduce effects of 60 Hz magnetic fields and shielding of the column to reduce radiofrequency interference. It was possible to demonstrate a current of 1nA into a 1nm probe diameter required for satisfactory high resolution analytical work. An ultrathin window Tracor Northern x-ray detector was fitted to the STEM column. Its energy resolution was found to be approximately 150 eV at Mn and it produced satisfactory results at low energies. X-ray spectra have been obtained from single molecules of ferritin (containing about 4000 iron atoms): large peak/background ratios were demonstrated confirming that detection limits of a few atoms will be feasible.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10297-01 BEI

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Investigation of Hepatocyte Mitochondrial Function by Analytical Electron Microscopy

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

R.D. Leapman	Physical Scientist	BEIB, DRS
M. Foster	Physicist	BEIB, DRS
W. Gitomer	Biochemist	LMMB, NIAAA
R. Veech	Chief	LMMB, NIAAA

COOPERATING UNITS *(if any)*

LMMB, NIAAA

LAB/BRANCH

Biomedical Engineering and Instrumentation Branch

SECTION

Electron Beam Imaging and Microspectroscopy Group

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, MD 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.6	0.6	

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Mitochondrial free calcium in hepatocytes was estimated by treating rats with sodium butyrate. Metabolism of such short-chain fatty .acids in mitochondria produces pyrophosphate and precipitates free calcium. Thin (80nm) cryosections of liver were sectioned using a cryoultramicrotome and transfered to an AEM for microanalysis. Dry wt. concentrations of calcium as well as diffusible ions (Na^+, Mg^{++}, K^+, Cl^-) were determined. Data were quantitated with software running on a Tracor Northern Analysis system and results were analyzed statistically on a Macintosh computer. Results support the view that there is high (approximately 1mM) free calcium in the mitochondria.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 10298-01 BEI

PERIOD COVERED

July 15, 1988 to January 1, 1989

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Optical Assessment of Tooth Vitality

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and Institute affiliation)*

J. Schmitt	Staff Fellow	BEIB/ACES
R. Webber	Researcher	NIDR

COOPERATING UNITS *(if any)*

NIDR

LAB/BRANCH

Biomedical Engineering and Instrumentation

SECTION

Applied Clinical Engineering Section

INSTITUTE AND LOCATION

DRS, National Institutes of Health, Bethesda, Maryland 20892

TOTAL MAN-YEARS: 0.7	PROFESSIONAL: 0.6	OTHER: 0.1

CHECK APPROPRIATE BOX(ES)

☒ (a) Human subjects ☐ (b) Human tissues ☐ (c) Neither
 ☐ (a1) Minors
 ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

A new method for determining the vitality of tooth pulp based on photoplethysmography and diffuse transmission spectrophotometry is being developed. Using a narrow-band light source and detector system designed and constructed in our lab, the ability to determine the quantity of hemoglobin in teeth by measuring the ratio of light transmitted at two wavelengths (595nm and 575nm) has been demonstrated in vitro; however, the sensitivity and selectivity of this method are poor because variations in the volume of hemoglobin contained in the dental pulp of normal teeth are large. To obtain an absolute measure of tooth vitality, we are now developing an instrument capable of measuring the amplitude of the pulsatile variations of light transmitted through the tooth at several wavelengths from which the oxygen saturation (ratio of the concentration of oxyhemoglobin to that of total hemoglobin) can be calculated. Both a bench optical system comprised of a lamp, filter wheel and detector and a portable LED-based spectrophotometer have been designed and constructed to carry out basic studies of the optical properties of teeth and to investigate the clinical utility of different vitality assessment techniques. Reliable detection of plethysmographic pulses in vital incisors and molars has been demonstrated.

VRB Research Project (Z01 RS)

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00084-01	Development of Genetic Profiles for Inbred Laboratory Rodents	J. S. Crowell	29

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER
Z01 RS 00001-18 VR

PERIOD COVERED
October 1, 1987 to September 30, 1988

TITLE OF PROJECT (80 characters or less. Title must fit on one line between the borders.)
Animal Model Development

PRINCIPAL INVESTIGATOR (List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)

PI: Carl T. Hansen Geneticist SAS, VRB, DRS

COOPERATING UNITS (if any)

LAB/BRANCH
Veterinary Resources Branch

SECTION
Small Animal Section

INSTITUTE AND LOCATION
DRS, NIH, Bethesda, Maryland 20892

TOTAL MAN-YEARS: 1.0	PROFESSIONAL: 1.0	OTHER: 0

CHECK APPROPRIATE BOX(ES)
☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
☐ (a1) Minors
☐ (a2) Interviews

SUMMARY OF WORK (Use standard unreduced type. Do not exceed the space provided.)

The objective of this program is developing new models for biomedical research utilizing the natural genetic variation found in sexually reproducing small research animals. The emphasis has been with certain mutants which are known to affect the functioning of the immune system, metabolic and neurological systems in rats and mice. The strategy has been to establish these mutants on different genetic backgrounds as well as making different combinations of independently appearing mutants. The result has been the formation of a unique resource of animal models which is gradually finding increasing acceptance by the research community.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER
ZO1 RS 00051-08 VR

PERIOD COVERED
October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Reproduction in Mutant Sheep Used for the Study of Hyperbilirubinemia

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

PI:	L.D. Stuart	Chief	UU, ACS, VRB, DRS
Others:	D.E. Wildt	Reproductive Physiologist	NZP, Smithsonian Institution
	S.C. Kalser	Director	Liver Diseases Prog., DDN, NIAID
	P.K. Chakraborty	Head	Research Division, Dept. of OB-GYN USUHS

COOPERATING UNITS *(if any)*
Digestive Diseases and Nutrition Program, National Institutes of Arthritis, Metabolism and Digestive Diseases

LAB/BRANCH
Veterinary Resources Branch

SECTION
Animal Center Section

INSTITUTE AND LOCATION
DRS, NIH, Bethesda, Maryland 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
.2	.1	.1

CHECK APPROPRIATE BOX(ES)
☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
☐ (a1) Minors
☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

A specific genetic strain of Corriedale sheep is used as an animal model for the study of liver pathophysiology, specifically, hyperbilirubinemia (Dubin-Johnson Syndrome). This project is concerned with increasing the numbers of animals available for research by the controlled breeding of individuals which genetically transmit this character. This project is utilizing what is considered to be the only existing Corriedale sheep homozygotic for this trait. Efforts are being made to obtain both homozygous and heterozygous offspring from these highly inbred individuals. Semen collected artificially from the homozygotic rams was diluted in various cryoprotective extenders and then freeze preserved. This will ensure the long-term availability of male gametes for artificial insemination. Overall this project allows perpetuation of this specific gene pool and ensures availability of research animals for future investigations of Dubin-Johnson Syndrome and related metabolic disorders.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 00070-04 VR

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Effect of Tocainide HCl Pretreatment of Surface-Induced Cardiac Hypothermia

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

PI:	M. April	Chief	PU, ACS, VRB, DRS
Others:	J.C. Keith	Assoc. Prof.	VMRCVM (VA-MD Reg. Col. Vet. Med.)
	P. Ruggera	Prod. Engineer	FDA, Center for Devices & Rad. Health
	J. Gainer	Ass. Br. Chief	FDA, Center for Veterinary Medicine
	K. Roberts	Assist. Prof.	VMRCVM (VA-MD Reg. Col. Vet. Med.)
	G. Kantor	Chief	FDA, Ctr. for Devices & Rad. Health

COOPERATING UNITS *(if any)*

Food and Drug Administration, Centers for Veterinary Medicine, and Devices and Radiological Health; and VA-MD Regional College of Veterinary Medicine

LAB/BRANCH

Veterinary Resources Branch

SECTION

Animal Center Section

INSTITUTE AND LOCATION

DRS, NIH, Bethesda, Maryland 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.0	0.0	0.0

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Studies with the beagle dog as the animal model were conducted on the initial phase of the project to ascertain the myocardial cytoprotective effects and antiarrhythemic effects of the drug (tocainide HCl; and the rapid rewarming effects produced by a radio-frequency (RF) helical coil. Hypothermic studies (using the beagle dogs) were also done to evaluate the effectiveness and safety of the RF coil. The coil proved to be effective and safe with the first five dogs. The heart muscle biopsies were evaluated by election microscopy. Tocainide's antiarrhythermic effect was excellent as viewed clinically and by B.P. and E.C.G. recordings. The second phase of the project using five more beagles to represent control animals will not be done. Results that were obtained with the first five experimental dogs along with the data that was gained for the use of the R.F. helical coil does not warrant the need of 5 more dogs to be used as controls. Myocardial biopsy evaluations proved tocainide (oral) to have cytoprotective response as does lidocaine (injectable) with similar membrane stabilization properties. The RF helical coil research has expanded into a new trend of experimentation in which live animals are not necessarily needed. Several important findings come out of this study, one of which being that frozen organ tissue can be rapidly rewarmed to normal body temperature for surgical implantation.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS-00071-04 VR

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Development of Genetic Profiles for Inbred Laboratory Rodents

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

J.S. Crowell, Geneticist	Comparative Pathology Section, VRB, DRS
S.L. Finley, Biochemist	Comparative Pathology Section, VRB, DRS

COOPERATING UNITS *(if any)*

Small Animal Section, VRB, DRS

LAB/BRANCH

Veterinary Resources Branch

SECTION

Comparative Pathology Section

INSTITUTE AND LOCATION

Division of Research Services, Bethesda, Maryland 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.5	0.4	0.1

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
- ☐ (a1) Minors
- ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

This project is designed to identify and locate on the chromosomes of inbred rodents inherited characteristics which can be used in a wide range of biomedical research and to further the ability of the Genetic Monitoring Unit to perform its basic mission. The major areas of interest are: 1) characterization of the genetic traits by biochemical and immunological techniques; 2) chromosome mapping by standard genetic analysis; and 3) application of the genetic characteristics to explore new animal models of pathogenesis.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 00072-04 VR

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Pathogenesis of cilia-associated respiratory (CAR) bacillis infections

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

K.S.Waggie, D.V.M.,PhD.	Comparative Pathology Section, VRB,DRS
A.M. Allen, D.V.M.,PhD.	Comparative Pathology Section, VRB,DRS
T.H. Spencer, B.S.	Comparative Pathology Section, VRB,DRS

COOPERATING UNITS *(if any)*

LAB/BRANCH

Veterinary Resources Branch

SECTION

Comparative Pathology Section

INSTITUTE AND LOCATION

Division of Research Services, Bethesda, Maryland 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
.06	.06	

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither

  ☐ (a1) Minors

  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

The cilia-associated respiratory (CAR) bacillus was first demonstrated with silver stains of sections of the respiratory tract of rats by workers in the Netherlands. It was isolated in embryonated hens' eggs by the staff of the Comparative Pathology Section and is believed to be a member of the group of gliding bacteria. The Bacillus has been associated with chronic respiratory disease in rats and mice. Peribronchial lymphoid infiltrates and hyperplasia of the mucosa associated lymphoid tissue were present in rabbits naturally infected with CAR bacillus. Experimental infection via the intranasal route resulted in CAR bacillus colonization of the nasal passages but no pulmonary pathology. This suggests that CAR bacillus is a minor respiratory pathogen in rabbits.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS-00073-04 VR

PERIOD COVERED
October 1, 1987 to September 30, 1988

TITLE OF PROJECT (80 characters or less. Title must fit on one line between the borders.)
Lipid Metabolism of the Macaca fascicularis

PRINCIPAL INVESTIGATOR (List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)

PI:	Dennis Barnard	Biologist	SAS, VRB, DRS
	Joseph Knapka	Physiologist	SAS, VRB, DRS

COOPERATING UNITS (if any)

LAB/BRANCH Veterinary Resources Branch

SECTION Small Animal Section

INSTITUTE AND LOCATION DRS, NIH, Bethesda, Maryland 20892

TOTAL MAN-YEARS: 0.6	PROFESSIONAL: 0.1	OTHER: 0.5

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
- ☐ (a1) Minors
- ☐ (a2) Interviews

SUMMARY OF WORK (Use standard unreduced type. Do not exceed the space provided.)

The study will examine the metabolism of exogenous fatty acids by Macaca fascicularis. Trans fatty acids which cannot be synthesized by eukaryotes will be used as the exogenous fatty acid marker. These fatty acids are geometrical isomers of cis fatty acids which can be synthesized by eukaryotes. The trans fatty acids are catabolized and removed from the body shortly after the fatty acids are removed from the diet. Twelve male M. fascicularis monkeys were used in the study. Six were fed the control diet, and the others received the experimental diet. The RBC membrane of monkeys fed the control diet contained .5% trans octadecanoate isomers of the fatty acids. Examination of the fecal fatty acids from these monkeys showed that biohydrogenation does occur in their gut producing trans fatty acids which appear to be incorporated into the RBC membrane. Within 6 weeks after initiating the study the RBC membranes of monkeys fed the experimental diet contained 10.8% trans octadecanoate isomers of the total fatty acids. Corresponding with the increase in trans fatty acids there was an increase in the membrane linoleate to arachidonate ratio. This indicated that trans fatty acids interfere with arachidonate synthesis. There was also a displacement of saturated fatty acids and cis octadecanoate isomers. The double bond index was calculated and indicated that the observed perturbations in the fatty acid content of the RBC membranes from monkeys fed the experimental diet resulted in decreased membrane fluidity.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 00077-04 VR

PERIOD COVERED
October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Development of an Embryo Cryopreservation Program in Laboratory Animals

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

PI:	Patricia Schmidt	Physiologist	SAS, VRB, DRS
	Carl Hansen	Geneticist	SAS, VRB, DRS
	Donna Pierce	Guest Researcher	SAS, VRB, DRS
	David Wildt	Guest Researcher	VRB, DRS

COOPERATING UNITS *(if any)*

LAB/BRANCH
Veterinary Resources Branch

SECTION
Small Animal Section

INSTITUTE AND LOCATION
DRS, NIH, Bethesda, Maryland 20892

TOTAL MAN-YEARS: 3.3	PROFESSIONAL: 2.3	OTHER: 1.0

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

The program objective is to facilitate the management of the NIH Animal Genetic Resource (NIHAGR) through development and utilization of techniques such as collection, culture, freezing and transfer of embryos and gametes for cryobanking genetic material and improving reproductive potential. The NIHAGR maintains a number of critical species and, within species, a vast number of invaluable genotypes used in biomedical research. Embryo preservation uses a cryoprotectant in the freezing medium which allows sufficient dehydration to protect the blastomers during freezing. Following thawing and dilution of the cryoprotectant, embryos are cultured to assess in vitro development. Transplantation of embryos into recipient females monitors in vivo development and thus biological competence. In vitro fertilization and ova freezing are being examined as techniques to salvage limited genetic material from single females or strains with poor in vivo fertilization rates. Banked embryos are maintained in a frozen state until needed for rederivation. A primary focus of laboratory efforts is the study and optimization of cryobanking technology in mice and more recently, in rabbits. A major research finding is that embryo freezability is confounded and influenced markedly by mouse genotype. Such responses have been examined in over 55 genotypes, most of which display genotype-specific survival rates to standardized embryo freeze-thawing procedures. Ancillary projects are oriented toward the comparative aspects of improving long-term embryo storage with particular emphasis on the study of cryoprotectants and enhancing methods for embryo freezing, thawing, dilution and transfer. Efforts in the rabbit focus on improvements in collection procedures and preservation of embryos using a newly developed vitrification procedure.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 00078-03 VR

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Serum Cholesterol Values of the NIH WHHL Rabbit

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

PI:	Dennis Barnard	Biologist	SAS, VRB, DRS
	Cheri Reid-Quinn	Veterinarian	SAS, VRB, DRS
	Joseph Knapka	Physiologist	SAS, VRB, DRS
	Carl T. Hansen	Geneticist	SAS, VRB, DRS

COOPERATING UNITS *(if any)*

LAB/BRANCH

Veterinary Resources Branch

SECTION

Small Animal Section

INSTITUTE AND LOCATION

DRS, NIH, Bethesda, Maryland 20892

TOTAL MAN-YEARS: 1.0	PROFESSIONAL: 0.5	OTHER: 0.5

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither

☐ (a1) Minors

☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

The Veterinary Resources Branch, Division of Research Services established a Watanabe Hyperlipidemic Rabbit (WHHL) breeding colony to be used as a resource for investigators requiring the use of this animal model. The colony is being characterized for serum total cholesterol, cholesterol levels of the lipoprotein fractions and serum triglyceride levels. Blood is being collected from rabbits at the following ages: six weeks, three months, seven months, and one year. Total serum cholesterol values ranged from 310 to 1251 mg/dl with a mean of 828 mg/dl. The low density lipoprotein (LDL) cholesterol values ranges from 1185 mg/dl with a mean of 630 mg/dl. Thus 80% of the total cholesterol was composed of LDL cholesterol. There was a substantial decrease from 885 to 576 mg/dl in serum total cholesterol between the ages of eight weeks and one year. The most significant decrease occurred between the ages of 15 to 25 weeks. There was no difference in total cholesterol concentrations due to sex. The serum triglyceride values ranged from 107 to 959 mg/dl with a mean of 394 mg/dl. There was an initial increase in triglyceride concentration from 367 to 565 mg/dl between two months and three months of age. However, the serum triglyceride concentration decreased to 349 mg/dl within one year of age. The serum triglyceride concentration was influenced by the sex of the rabbit. The mean male and female serum triglyceride concentrations were 510 mg/dl and 309 mg/dl respectively.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER
Z01 RS 00080-02 VR

PERIOD COVERED
October 1, 1987 to September 30, 1988

TITLE OF PROJECT (80 characters or less. Title must fit on one line between the borders.)
Effects of Progesterone on CEH in the SLA Inbred Miniature Pig

PRINCIPAL INVESTIGATOR (List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)

PI:	K.J. Lipetz	Director of Lab.	Montgomery Infertility Inst.
Others:	L.D. Stuart	Chief	UU, ACS, VRB, DRS
	N.L. Garnett	Vet. Med. Officer	ACS, VRB, DRS

COOPERATING UNITS (if any)

LAB/BRANCH
Veterinary Resources Branch

SECTION
Animal Center Section

INSTITUTE AND LOCATION
DRS, NIH, Bethesda, Maryland 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
.05	.025	.025

CHECK APPROPRIATE BOX(ES)
☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK (Use standard unreduced type. Do not exceed the space provided.)

The SLA inbred miniature pig herd, bred and maintained by the Ungulate Unit for the Immunology Branch, NCI typically produces a small litter and exhibits a variety of reproductive problems not found in the standard-sized pig. A uterine condition, cystic endometrial hyperplasia (CEH), exists in the herd and is directly involved in reducing the reproductive efficiency of the herd. Sows that are not bred until after one year of age have a high incidence of CEH and are incapable of reproduction. Regression or reduction of the incidence of CEH would improve greatly the reproductive performance of the herd. Previous studies have shown the SLA inbred miniature pig has a serum progesterone level considerably lower than the standard-sized pig. The effects of long term administration of progesterone of CEH will be studied.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER

Z01 RS 00081-02 VR

PERIOD COVERED

October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*

Control of Luteal Function and Induction of Ovulation and Conception in the Anestrus Bitch.

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

PI:	P.K. Chakroborty	Head, Research Division Obstetrics & Gynecology	USUHS
Others:	R.L. Killens	Chief, Carnivore Unit	ACS/VRB/DRS
	J.L. Brown	Research Associate Obstetrics & Genecology	USUHS

COOPERATING UNITS *(if any)*

Carnivore Unit, ACS, VRB, DRS; Research Division, Department of Obstetrics and Gynecology, USUHS.

LAB/BRANCH

Veterinary Resources Branch

SECTION

Animal Center Section

INSTITUTE AND LOCATION

DRS, NIH, Bethesda, Maryland 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
.6	.4	.2

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither

☐ (a1) Minors

☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

This project is designed to study the effect of two treatment regimens using hormone stimulants to induce ovulation and conception in bitches. The major areas of interest are: 1) the induction of regression of the functional corpora lutea by hormone administration; and 2) the induction of follicular development and ovulation followed by breeding bitches pretreated with hormone to regress corpora lutea.

PHS 6040 (Rev. 1/84) GPO 914-918

DEPARTMENT OF HEALTH AND HUMAN SERVICES · PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER
Z01 RS 00082-01 VR

PERIOD COVERED
October 1, 1987 through October 1, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Acute Effects of Thromboxane Synthetase Inhibition in Gravid Macaques

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

PI:	M. April	Chief	PU, ACS, VRB, DRS
Others:	D. Renquist	Chief	ACS, VRB, DRS
	J. Keith	Assoc. Prof.	VMRCVM (VA-MD Reg. Col. Vet. Med.)

COOPERATING UNITS *(if any)*
VA-MD Regional College of Veterinary Medicine.

LAB/BRANCH
Veterinary Resources Branch

SECTION
Animal Center Section

INSTITUTE AND LOCATION
DRS, NIH, Bethesda, Maryland 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.050	0.025	0.020

CHECK APPROPRIATE BOX(ES)
☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

Preeclampsia is a hypertensive disease of late pregnancy and is a major cause of maternal and fetal mortality and morbidity. Five to ten percent of all pregnancies and up to 20 percent of primagravidas are affected yearly in the United States. The only curative treatment for this syndrome is early delivery, resulting in many neonatal complications due to prematurity.

Recently several laboratories have documented low levels of prostacyclin (PGI2) and/or elevated levels of thromboxane A2 (TxA2) 1-5. Similar results have been seen in this disease in an ovine model of preecloampsia, and beneficial, effects of thromboxane synthetase inhibitors have been reported in the ovine model. However, the effects of thromboxine synthetase inhibitors have not been studied in gravid primates.

The purpose of this study is to determine the effects of CGS 12970, 3-menthyl-2 (3-pyrodyl)-1-idoleoctanoic acid, a thromboxane synthetase inhibitor, in gravid nonhuman primates (rhesus).

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE **NOTICE OF INTRAMURAL RESEARCH PROJECT**	PROJECT NUMBER Z01 RS 00083-01 VR

PERIOD COVERED
October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Mouse Strain Susceptibility to Bacillus piliformis.

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

PI:	K.S. Waggie	Chief, Microbiology Unit	CPS,VRB,DRS
	C.T.Hansen	Geneticist	SAS,VRB,DRS

COOPERATING UNITS *(if any)*

LAB/BRANCH
Veterinary Resources Branch

SECTION
Comparative Pathology Section and Small Animal Section

INSTITUTE AND LOCATION
DRS,NIH Bethesda, Maryland 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
.06	.02	04

CHECK APPROPRIATE BOX(ES)

☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
- ☐ (a1) Minors
- ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

The objective of this project was to find a mouse strain that is susceptible to B. piliformis infection via the oral (natural) route. A susceptible strain would aid in pathogenesis studies and might act as sentinel animals to detect naturally occurring infections in rodent colonies.

Mice with various immunodeficiencies were orally inoculated with B. piliformis spores. Mice were killed 5 days post-inoculation and examined for gross lesions. Tissues were also collected for histopathology. Mouse strains utilized were as follows: CBA/N, P/N, C3H/HeJ, C3H/HeN (C3H), C3H-nu, C3H-bg, C3H-xid, C3H-bg,nu; C3H-bg,xid; C3H-nu,xid.

No significant gross lesions were present in any of the inoculated mice. Cecocolitis was microscopically evident in C3H-bg,nu mice, however, no B. piliformis - like bacteria were observed in silver stained sections. Further studies need to be done to determine if C3H-bg,nu mice are susceptible to B. piliformis infection and, if so, if they would be a suitable sentinel animal.

DEPARTMENT OF HEALTH AND HUMAN SERVICES - PUBLIC HEALTH SERVICE

NOTICE OF INTRAMURAL RESEARCH PROJECT

PROJECT NUMBER
Z01 RS 00084-01 VR

PERIOD COVERED
October 1, 1987 to September 30, 1988

TITLE OF PROJECT *(80 characters or less. Title must fit on one line between the borders.)*
Development of Genetic Profiles for Inbred Laboratory Rodents

PRINCIPAL INVESTIGATOR *(List other professional personnel below the Principal Investigator.) (Name, title, laboratory, and institute affiliation)*

J.S. Crowell, Geneticist	Comparative Pathology Section, VRB, DRS
S.L. Finley, Biochemist	Comparative Pathology Section, VRB, DRS

COOPERATING UNITS *(if any)*
Small Animal Section, VRB, DRS

LAB/BRANCH
Veterinary Resources Branch

SECTION
Comparative Pathology Section

INSTITUTE AND LOCATION
Division of Research Services, Bethesda, Maryland 20892

TOTAL MAN-YEARS:	PROFESSIONAL:	OTHER:
0.5	0.4	0.1

CHECK APPROPRIATE BOX(ES)
☐ (a) Human subjects ☐ (b) Human tissues ☒ (c) Neither
  ☐ (a1) Minors
  ☐ (a2) Interviews

SUMMARY OF WORK *(Use standard unreduced type. Do not exceed the space provided.)*

This project is designed to identify and locate on the chromosomes of inbred rodents inherited characteristics which can be used in a wide range of biomedical research and to further the ability of the Genetic Monitoring Unit to perform its basic mission. The major areas of interest are: 1) characterization of the genetic traits by biochemical and immunological techniques; 2) chromosome mapping by standard genetic analysis; and 3) application of the genetic characteristics to explore new animal models of pathogenesis.

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